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ABSTRACT

This study examined four teacher in-service environmental education programs to: (1) suggest a workable evaluative model for such programs; (2) assess their content with respect to stated activities and objectives; and (3) determine whether or not the experiences correlated with changes in selected teaching behaviors. The research design included observation, a descriptive survey, and ex post facto methods. An experimental group, comprised of in-service participants, and a control group, made up of two sub-groups of teachers, completed pre- and post- questionnaires. Principals of all research subjects also received questionnaires. A significant discrepancy was found, using ANOVA, in what the teachers and the principals reported administrators' attitudes toward environmental education to be. Correlated t-tests showed significant increases from pre- to post-study in (1) the amount of time the experimental subjects spent teaching environmental education, and (2) the number who took environmentally-oriented field trips. Pearson product-moment correlations indicated that the more teachers had been exposed to environmental education in-service programs, the more time they spent on environmental lessons in their classrooms. Strong positive correlations were also found between attitudes and behaviors with respect to three pairs of variables. There were varying degrees of success among the four programs in completion of the activities originally intended by the in-service leaders. (Author/BB)

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CHANGES IN ATTITUDES TOWARD ENVIRONMENTAL EDUCATION AND SELECTED TEACHING BEHAVIORS OF TEACHERS PARTICIPATING IN ENVIRONMENTAL EDUCATION WORKSHOPS

A Thesis

Presented in Partial Fulfillment of the Requirements
for the Degree Master of Science

by

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1979

BEST COPY AVAILABLE

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The research design included observation, a descriptive survey, and ex post facto methods. An experimental group, comprised of in-service participants, and a control group, made up of two sub-groups of teachers, completed pre- and post- questionnaires. Principals of all research subjects also received questionnaires.

A significant discrepancy was found using ANOVA in what the teachers and the principals reported administrators' attitudes toward environmental education to be. Correlated t-tests showed significant increases from pre- to post-study in (1) the amount of time the experimental subjects spent teaching environmental education, and (2) the number of them who took environmentally-oriented field trips. Pearson product-moment correlations indicated that the more teachers had been exposed to environmental education in-service programs, the more time they spent on environmental lessons in their classrooms. Strong positive correlations were also found between attitudes and behaviors with respect to three pairs of variables.

There were varying degrees of success among the four programs in completion of the activities originally intended by the in-service leaders. There is reason to believe that the objectives relating to helping the in-service participants implement environmental education lessons in the classrooms were achieved.

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CHAPTER I

BACKGROUND AND SETTING

Introduction

The authors of the Environmental Education Act of 1970 stated that the current environmental deterioration has been caused partly by a lack of understanding about the environment and the need for ecological balance. Since education is the usual method of increasing understanding, environmental education has evolved as the means to develop an environmentally literate citizenry. With schools established as the main center for formal education in our society, it would seem appropriate to introduce environmental education into the curricula in order to reach a large segment of the population. This conclusion forces an examination of those responsible for the development of content and materials to be used in the schools.

Legislators and administrators may determine that environmental studies should be part of the curriculum, but Childress (1978) and Bottinelli (1976) found that teachers are most often the primary source of content and materials actually used with students. However, research has shown

that many teachers are not prepared to integrate environmental education into their courses of study. Childress' (1978) survey of a national sample of public school environmental education program directors listed funding, lack of time, and inadequate teacher training as the primary constraints in curriculum development for 60 percent of the respondents. In a 1973 study, Holt reported that of 165 competencies needed by teachers working with resident outdoor education programs, program directors identified only nine and classroom teachers listed only 24 as competencies already possessed by elementary teachers. Thus, it appears that teachers are the individuals most responsible for and at the same time the least qualified to lead environmental education in the schools.

As a result of this inconsistency, one of the main concerns of environmental education is that of teacher education. Bennett (1975) stated that teachers have a greater probability of success if they possess the knowledge, attitudes and skills that they are attempting to provide their students. He felt that the purpose of in-service teacher education is to increase subject matter understanding and to encourage the preparation of teaching methods. Buethe (1975) found that many teachers in his study were "ill-informed or mis-informed" about environmental terms, concepts and problems. He voiced concern over this situation because of the assumptions that:

> 1) our teachers are at times environmental educators and, 2) teachers teach mainly in terms of what they know and how they feel.

It would seem that in-service teacher education for the purpose of increasing instructors' environmental knowledge, awareness and teaching skills is a prerequisite for an environmental education program in the schools.

Significance of the Problem

As a result of this pressing need for teacher education, courses and workshops have been sponsored by colleges and universities, state departments of education, government agencies, and private organizations and institutions. Swan (1969) said that such educational programs should be able to answer two questions:

> (1) Are the program's stated objectives being accomplished effectively and efficiently? and (2) Should amendments in purpose and operation be made to maximize the program's impact?

Little empirical evidence can be obtained from the literature in response to these questions in relation to most environmental education programs. Of 475 works listed in Dissertations in Eco-education (Swan, et al. 1977), 14 deal with teacher in-service education directly, and only five of those evaluate or measure the effect of the workshop or in-service on teacher knowledge, attitude or behavior. In Roth's (1976) A Review of Research Related to

Environmental Education, 1973-1976, ten studies referring to teacher education are cited, but only two of those pertain to evaluation of programs. In his summary, Roth (1976) states:

> Research has been done in this field, but little data exist from which strong inferences can be drawn. The development of model programs, guidelines, and attitude assessment comprised most of the effort in the teacher education area. The mixed results obtained by the studies cited indicate a need for more rigorous evaluation and analysis techniques.

In response to this situation, this researcher will examine four in-service environmental education programs to: (1) suggest a workable evaluative model for such programs; (2) assess their content with respect to stated activities and objectives; and (3) determine whether or not the experiences correlate with changes in attitudes toward various aspects of environmental education and changes in selected teaching behaviors.

Components of the Study

The Aullwood Audubon Farm in Dayton, Ohio, an affiliate of the National Audubon Society, developed an in-service teacher training program and requested an evaluation of its effectiveness. A grant from the George Gund Foundation of Cleveland supported the development and evaluation of the project. Workshops were conducted at the Aullwood Farm in the summers of 1975 and 1977. The Aullwood staff also sponsored and helped organize workshops at

Shaker Lakes Regional Nature Center in Cleveland during the 1977 and 1978 summers. Crosby Gardens in Toledo was the center for another Aullwood-sponsored workshop in 1978. For the purpose of this study, only the two 1978 (Cleveland and Toledo) workshops were examined, since control of extraneous variables for teachers involved in previous years would have been very difficult. The workshops were all to utilize a three-phase outline involving orientation, practicum and implementation. Activities for each phase were to be as follows:

Phase I

1. Define environmental education and its philosophies and techniques.
2. Integrate environmental education with existing subjects.
3. Explore the resources of the workshop site.
4. Prepare an initial program of instruction.

Phase II

5. Use the initial program with elementary children involved in the workshop.
6. Evaluate and discuss these programs or lesson plans.
7. Prepare instructional materials for use in the workshops.
8. Discuss means for adapting instructional plans for use in the classroom, with the discussion supplemented by outside resource people.

Phase III

9. Develop an environmental studies unit for an individual classroom.

10. Obtain feedback from peers concerning this proposal or unit.

11. Implement the unit in the classroom.

12. Evaluate the unit as it was conducted through discussion with peers from the workshop.

The specific objectives to be achieved as a result of these activities are for the teachers to be able to:

1. make greater use of "hands-on" experiences in the classroom

2. develop an environmental studies unit or lessons for use in their own classroom

3. make use of natural materials and resources in their classroom

4. share ideas, activities, and suggestions with their peers, both at the workshop and in their home schools.

See Appendix A for a description of the organization of the programs as university courses and for an outline of the daily activities at each workshop.

The overall goal of the Aullwood Audubon Farm is to use these criteria to establish a model for teacher workshops that can be conducted by nature centers, land laboratories, or Audubon chapters, in cooperation with local universities, without the direct input of the Aullwood staff. Such a model could help maintain the quality and continuity of workshops held in diverse locations and with different leaders and sponsors.

As a comparison for the effectiveness of the two Audubon Farm-sponsored workshops and as a test of the generalizability of this evaluative model, two other in-service programs, each with a slightly different approach, were included in this study.

One of the other programs took place at the Aulwood Audubon Center in June of 1978. Its objectives were:

1. to make teachers feel good about the world around them and to develop positive attitudes towards wild plants and animals
2. to become more perceptive and sensitive to the "real world"
3. to help teachers feel more confident with environmental education
4. to encourage teachers to use the outdoors more often
5. to help teachers find ways to incorporate facets of the environment into the ongoing curriculum.

See Appendix A for a description of the organization of this program and an outline of daily activities.

The final in-service program examined in this study was a course offered at The Ohio State University, Natural Resources 611, a Field Course in Conservation and Outdoor Education, also intended primarily for in-service teachers. The course objectives were:

1. to develop understanding of the concepts of environmental management education, conservation education, outdoor education, and natural history

2. to develop within teachers the self-confidence and skill to work with their students in each of the aforementioned areas--particularly in out-of-doors settings

3. to help teachers develop, design, and implement an extensive environmental education curriculum plan to be used by other teachers, as well as themselves, in their respective teaching situations.

See Appendix A for a description of the course and an outline of daily activities.

The main difference between the two Aullwood Farm-sponsored workshops and the Aullwood Center program and The Ohio State University Field Course is that the former involved a practicum phase in which elementary students participated for part of the day. The Farm workshop teachers were responsible for their instruction during this time and so had the added dimension of not only preparing instructional materials, but of being required to use them right away with this group of students.

Definition of Terms

Osgood (1957) and Fishbein and Raven (1967) differentiate between "beliefs" and "attitudes" by stating that a belief asks the question, "What is the probability that such a phenomenon does exist?", and an attitude asks, "Is it good or bad?" In this study, respondents were asked how they feel about certain aspects of the curriculum using evaluative paired adjectives. Those questions are referred to as the "attitude variables" of the study.

"Teaching behaviors" are those activities which take place within the curriculum and can be quantified as to the number of times or length of time devoted to them.

"Hands-on" activities are those involving the use of materials and equipment other than paper and pencil.

"Discovery learning" is the inquiry or inductive reasoning method of learning.

"Process approach" refers to the scientific method in which the student formulates hypotheses, gathers data, and draws conclusions.

Problem Statement

The purpose of this project was:

1. To develop an evaluative model for environmental education in-service teacher workshops
2. To use that design in relation to four such programs offered during the summer of 1978: two sponsored by the Aullwood Audubon Farm, one by the Aullwood Audubon Center, and the Field Course in Conservation and Outdoor Education at The Ohio State University.

Subproblems were:

1. To assess the content of the in-service programs with respect to stated activities and objectives

2. to determine whether or not the in-service experiences correlate with changes in attitudes toward various aspects of environmental education and changes in selected teaching behaviors.

CHAPTER II

RELATED RESEARCH AND LITERATURE

The literature provides numerous descriptions of in-service environmental education opportunities, their goals, and means of achieving them. Some studies have been conducted to determine the cognitive gains by the participants in such programs. There have also been a few attempts to document changes in teacher behavior following in-service training. The results and the design of these studies have been examined as guidelines for this research.

Need for Teacher Training

Inadequate teacher training has been cited as one of the main constraints to environmental education in the schools. Ritz (1977) reported that relatively few teachers receive either pre-service or in-service training in the methods of teaching environmental education. In a survey of 261 sixth-grade classroom teachers regarding their readiness and preparation for outdoor education, Wiles (1973) found that one of the main recommendations was to organize in-service training experiences. Trent (1976) sent a questionnaire to 777 teacher institutions of education to

determine the changes in their curriculum from 1970-1975. The results of the survey included the following:

Teacher colleges offering in-service environmental education courses for teachers

1972	49.5%
1973	57.5%
1974	44.7%
1975	59.5%

State departments of education financing or operating in-service workshops

1972	38.6%
1973	51.0%
1974	63.4%
1975	67.6%

Percent of teachers who have received in-service or pre-service instruction in the methods of teaching environmental education

in 1975

less than 10%	44.2%
10-29%	35.3%
30-79%	20.6%
over 80%	0.0%

Thus, it appears that an increasing number of teacher colleges and state departments of education are attempting to provide training for interested teachers, but there were, as of 1975, still a large number of practicing teachers who had not had such an experience.

Goals and Guidelines

For in-service programs that have already been or are to be established, there is general agreement as to what

the goals and guidelines should be. Holt (1976) suggested that one format for teacher environmental education might involve cooperation between a university, public schools, and an outdoor education center, and could include summer classes for elementary school children. Among the in-service guidelines listed by Engelson (1975) are to:

1. provide for university credit
2. provide the opportunity for each participant to develop curriculum materials relevant to his own educational program
3. help participants develop knowledge, behavioral skills (methods or approaches) and person-ological skills (ways teachers work with students)
4. provide values clarification activities
5. provide experiences in both the natural and man-made environments
6. have follow-up activities after the program is completed to help in implementing.

A state department of education workshop at Bowling Green State University covered such topics as the definition of environmental education, values clarification, and techniques for teaching environmental education. The main goal for that experience was to help the participants become more aware of the environment and its problems and to motivate them to aid in solving those problems (DuShane, 1974). Project Outdoors (Oates, 1970) had as its objectives: to increase awareness and understanding of the environment, to show teachers various ways the out-of-doors can be used in teaching, and to illustrate the use of school and community resources for environmental education instruction. Similarly, Project SPRUCE's (Busch, 1969) main aims were to provide a

product (science conservation)
process (the method of inquiry)
production ("indoors-outdoors").

Others suggest that teachers involved in an in-service should learn facts and concepts about the environment (Keach, 1973; Gallagher, 1975; Ritz, 1977; Childress, 1978). Some authors also emphasize a need for in-service education to include materials and strategies for teaching environmental education (Keach, 1973, Mirka, 1973; Gallagher, 1975; and Ritz, 1977). From these sources the main purposes of in-service training seem to be to increase the participants' knowledge and awareness of the environment, and to develop teaching techniques to be used for environmental education in the classroom.

Teaching Techniques

There are several approaches to learning using direct and more concrete experiences for children. These methods involve teaching techniques which may be necessary for instructors to develop. Bennett (1975) said that skills such as discovery-inquiry, evaluation-problem identification, and problem-solving are basic to most curricula, but particularly to science and social studies, which is where environmental education tends to center. In describing an Oklahoma workshop, Kellogg (1975) explained that participants were required to demonstrate how they were going to use the

skills and knowledge they had acquired, and to tell of their plans to integrate hands-on activities with their students. Bailey (1978) felt that experienced staff members should demonstrate for teachers various strategies using real students and that

> no amount of theory about the design of the curriculum, methods of instruction, or improvement of teaching can substitute for direct hands-on experience with the student materials.

In general, then, discovery, problem-solving, and hands-on techniques seem to be favored for environmental education, and there is agreement that teachers need to be exposed to these methods during workshops to help them know how to implement them in their own classrooms.

Cognitive Growth

Since one of the main goals of teacher education is to increase their cognitive understanding of the natural and man-made environments, it is necessary to examine studies which have tested this factor. In evaluating an environmental education symposium for secondary teachers, Milson (1975) found significant cognitive change in the participants between a pre- and a post-test. The evaluation of Project Outdoors (Oates, 1970) reported that the teachers had significantly higher scores on cognitive items in six out of fifteen test items and were lower on only one item on the post-test. Hulleman (1972) found a significant gain

on a test of science knowledge by elementary teachers after an in-service experience. Thus, even though there has not been a great deal of research dealing with cognitive gains made by teachers participating in in-service education, the studies reported generally seem to indicate that increases in factual knowledge can be expected.

Out-of-Doors

Increased knowledge of the environment is not in itself a guarantee that a teacher will include environmental studies in the curriculum. Therefore, it is necessary to study the attitudes of teachers concerning environmental education. One researcher investigated the factors affecting teachers' utilization of one technique of instruction--use of the out-of-doors. In that study, Mirka (1973) surveyed teachers of grades 1-6 who had and who had not used the out-of-doors for instruction. He found that those who have, did so because of:

1. the value of the experience to the children
2. the recognition of the school site as a teaching area
3. knowledge of the application of subject matter to the out-of-doors
4. knowledge of how to plan and conduct outdoor experiences
5. personal feelings about the out-of-doors
6. the ability to accept change in the daily routine
7. favorable results from previous experiences
8. class size.

Other studies have investigated participants of workshops to see if that experience could be named in addition to the factors above as correlating not only with the use of the out-of-doors, but with other teaching skills and techniques as well. Research regarding the National Science Foundation (NSF) Institutes is the most extensive in an area similar to in-service environmental education workshops. In his summary of the impact of the NSF Institutes, Helgeson (1974) stated that two-thirds of the participants reported having implemented new curriculum materials in their classrooms after attending the Institutes. He also concluded that in most instances teacher behavior did change in the direction that the Institute organizers had hoped it would. Even though extraneous factors could not be excluded in all cases, Helgeson stated that it is

> reasonable to conclude that the Institutes were significant causative agents in promoting improved teaching.

Oates (1970) in the study of Project Outdoors, reported that teachers involved in the project used environmental topics with their classes to a significantly greater extent, and tended to take their classes out-of-doors more frequently than those not completing the program. Busch (1969), in investigating Project SPRUCE, also found that there was a significant difference at the .01 level between pre- and post- observations in the participants' use of

outdoor resources. Milson (1975) found that after attending an environmental education symposium, secondary teachers indicated they would include a greater number of environmental-related materials in their curriculum. In testing attitude toward environmental science, Hulleman (1972) found that elementary teachers rated it as having more importance and that they felt more adequate to teach it after an in-service experience.

Thus, it appears that following in-service education teachers can be expected to make greater use of the out-of-doors and include more environmental topics in their classrooms.

Design of Evaluations

A search of the literature for specific evaluative models for teacher in-service programs in environmental education yielded very little in the way of research fitting all of those components. Therefore, this study has been compelled to rely upon the design and methods used in several projects of a similar nature in related fields.

Chase (1969) reviewed the evaluation procedures for 97 outdoor education Title III, ESEA projects and found that the majority used either a questionnaire to be filled out by the participants or a report completed by a leader-in-the-field who was paid to evaluate the project. Project Outdoors

(Oates, 1970) and the survey by Buethe (1975) in Indiana are examples of the former technique. Chase (1969) himself used a normative survey type design in which he employed a test-retest technique of elementary teachers in Illinois. Project SPRUCE's method of evaluation was to place two observers in the classes of peoject teachers to assess changes in teaching behaviors pre- and post- in-service experience (Busch, 1969). Ambry (1969) developed a method for evaluation of the whole spectrum of an environmental education program. One page of this model deals with in-service preparation of teachers. It is a checklist, completed by an evaluator, describing the type of program provided for the teachers in the system (see Appendix B).

Chase (1969) points out that there are basic weaknesses in both the survey questionnaire and in the observer of the program types of evaluation. The results of a survey depend upon who, how many, and what percentage of the total population are surveyed and how the questions are phrased. The problem with the leader-in-the-field (and even more so with a self evaluation) is that he is employed by the agency to be evaluated, and might be less than objective in his evaluation.

In order to avoid the lack of objectivity and to compare the differences between teachers who attend in-service programs and those who do not, some studies have

used experimental and control groups for comparisons. Hulleman (1972) tested elementary teachers' science achievement and attitudes toward environmental science in this manner. Jackson (1970) tested changes in teacher behavior and pupil achievement of junior high earth science classes using a study group and two comparison groups which he pre- and post-tested. Milson (1975) also used an experimental-control group design with a pre- and post-test consisting of questions about environmental problems, environmental topics to be included in the secondary curriculum, and reactions to the structure of the symposium itself. Gallagher (1975) used the same design to evaluate content, values, and attitude changes of those participating in the Governor's State Project.

The evaluative instruments used in the studies cited contain some similarities which were examined as a basis for the ones used in this research. Ritz (1970), Oates (1970), and Kellogg (1975) asked the participants for their reactions to the structure of the in-service programs themselves. Their opinion as to the quality of the activities, amount of time spent on each, and the teacher's assessment of success in meeting the workshop objectives were all sought. Payne (1951) questions the validity of such an approach because he feels that respondents are relatively free with praise but are hesitant to criticize and, as a result, only strong objections are reported.

A number of researchers (Busch, 1969; Chase, 1969; Ritz, 1970; Hulleman, 1972; Mirka, 1973; and Helgeson, 1974) asked their respondents about certain attribute variables to determine their effect upon the questions or hypotheses involved. This background information included: age, years of teaching experience, degrees, and fields of study.

Cognitive and/or affective changes were measured by researchers in fairly standard ways. Those studies whose aim was to evaluate cognitive learning administered either a multiple choice test (Chase, 1969; Oates, 1970; Hulleman, 1972; and Buethe, 1975) or a Likert-type response to factual or conceptual statements (Milson, 1975). Attitudes toward the environment were generally assessed by a semantic differential response form (Oates, 1970; Buethe, 1975). Teachers' opinions concerning curriculum content (Chase, 1969; Oates, 1970; and Milson, 1975) and their feelings of adequacy in teaching various concepts (Hulleman, 1972) were also measured with either a 3, 5, 7 or 10 point semantic differential scale.

To evaluate teaching behaviors a variety of methods have been used. For Project SPRUCE two observers attended the classes of project teachers and noted the amount of time spent on various cognitive functions, both at the beginning and the end of the project (Busch, 1969). Some of the NSF Institutes asked students to complete the Science Classroom Activity Checklist describing the way in which the teacher

structured classes (Helgeson, 1974). Video tapes were employed in the Teacher Practices Observation Record method of evaluation (Helgeson, 1974). The Goal Oriented Teaching Exercise is a procedure that relates patterns of teacher behavior to student achievement (Hill, 1969).

In conclusion, evaluations of in-service workshops have generally used either a survey or experimental-comparison group procedure. A pre- and a post-questionnaire is a common method of collecting data, with attribute variables documented to assess their correlation with other variables. Likert-type or semantic differential scales have been used to measure both cognitive and affective gains, and a variety of observation and student assessment techniques have been used to describe or verify teacher behavior.

Summary

Inadequate teacher training has been cited as one of the main constraints to environmental education in the schools. Numerous environmental educators suggest that a solution to this problem is through in-service training which attempts to increase the participants' knowledge and awareness of the environment, and to develop teaching techniques such as "discovery" and a "hands-on" approach to environmental education in the classroom. A few studies indicate that in-service participants can be expected to

increase their factual knowledge of the environment, to make greater use of the out-of-doors, and to include more environmental topics in their curriculum.

Evaluations of in-service workshops have used both descriptive survey and ex post facto (correlational) research procedures. Questionnaires have often been used to gather data, including background information for the subjects. Cognitive and affective variables have often been measured using Likert or semantic differential scales. A variety of observation techniques have been used to describe teacher behavior.

Objectives of the Study

As a result of the problem at hand and the previous research cited, the following question and hypothesis are posed.

Question

As recorded by an observer using a checklist and from responses to a questionnaire by participants, to what extent did the proposed activities take place during the course/workshop?

Hypothesis

In correlation with attendance at an in-service environmental education workshop/course, participants

should exhibit more positive attitudes toward selected aspects of environmental education and should receive higher ratings on the post-questionnaires in relation to specified environmental studies teaching behaviors than do non-participants.

CHAPTER III

PROCEDURE

Design

A descriptive study was used to answer the question listed on page 23. This question was answered through observations made by the researcher using a checklist designed to assess the intended content of the workshops.

Observations took place during the first three or four days of each workshop/course, at regular intervals throughout the programs, and again for the last two or three days of each experience.

The researcher also interviewed randomly selected teachers at the end of each workshop/course concerning the materials or lessons they had prepared as a result of the experience. Each participant was asked to respond to a questionnaire three or four months after the in-service concerning the extent to which stated activities took place.

An ex post facto design was used to test the hypothesis. The experimental subjects were those who self-selected a level of the independent

variable, which was attendance at a summer environmental education workshop or course. The comparison groups were made up of subjects in a purposive sample. The design is similar to that described by Campbell and Stanley (1963) for a non-equivalent control group design, but was ex post facto in nature rather than quasi-experimental. The graphic representation of that design is as follows:

$$\begin{array}{ccc} O_1 & X & O_2 \\ \text{- - - - - - - - - - -} & & \\ O_3 & & O_4 \end{array}$$

The pre-test to be administered to all subjects included questions about attribute and personological variables. This data was used as a strategy for controlling extraneous variables and testing group similarity. The pre-test also included questions concerning concepts, attitudes, and teaching behaviors relating to environmental education and the objectives of the workshop/course leaders.

Post-questionnaires of a similar design were mailed December 1, 1978, to all of those in both experimental and comparison groups who returned the initial form. A follow-up letter was sent January 3, 1979, and one or two phone calls in mid-January solicited final non-respondents.

Principals of all respondents were asked to return a questionnaire which was mailed to them December 1, 1978. This form contained the same questions as those of the teachers concerning attitudes and teachers' classroom

activities. A follow-up letter was sent January 3, 1979, to non-respondents in the principal's group.

As with any ex post facto design, the major threat to internal validity in this study was that subjects were not randomly assigned to groups or to levels of the independent variable. It was anticipated or assumed that error was controlled by the selection of the comparison groups and by gathering information on attribute and personological variables to be used in the analysis of the data.

Non-response to the post-test questionnaires was dealt with through additional mailed requests and telephone reminders since anonymity was not a factor in this study, and all subjects had signed the Human Subjects consent form before agreeing to participate.

"Selection" was a possible threat to external validity, since it was necessary to rely on those who agreed to participate out of the accessible populations for both the experimental and the comparison groups. Thus, there were some teachers in both groups who did not agree to participate and who might possess characteristics different from participants.

"History" was also a possible threat in that the study has attempted to correlate the results on the dependent variables or listed objectives with the treatment,

when in fact, the treatment consisted of four different workshops conducted in different locations with as many leaders. Theoretically, the objectives of the workshops/course were similar enough that results should be approximately the same for all four. In addition, this variety is actually an advantage with respect to testing the generalizability of the study as an evaluative model for environmental education teacher in-service experiences.

Population and Sample

For the descriptive part of the research, the population observed was the teachers who self-selected to attend the environmental education workshops or course and the leaders in each location.

In the ex post facto section of the study, all of the teachers in the workshops or course who met the requirements of the design and who agreed to participate, comprised the experimental group. The specifications were for a participant to have been a classroom teacher (K-12) the year preceding and for the year to follow the workshop/course. Table 1 indicates the total number of those attending each session, the number of practicing teachers in each group, and the number who agreed to participate by returning a questionnaire and signing the consent to serve as a subject in research (see Appendix G).

Table 1.--Attendance and research participants for experimental groups for each location.

Location	Total Attendance	Practicing Teachers	Research Participants
Dayton	29	20	9
Columbus	13	9	7
Cleveland	5	5	5
Toledo	16	11	9

The researcher distributed pre-questionnaires to all of the practicing teachers at the beginning of each workshop/course with the request that they be returned within a few days.

The comparison group was made up of two sub-groups. The first was students taking Education 861, Fundamentals of Supervision, a graduate course in education at The Ohio State University, summer quarter 1978. The reason for requesting subjects from this particular population was that the researcher assumed that teachers who self-select to attend summer school, involving graduate credit and the ensuing university costs and time commitments, are not necessarily representative of the general teaching population. Therefore, another group of teachers similar to the workshop participants on that variable were included as a control. The second comparison sub-group was comprised of

individuals randomly selected from a list of teachers of the same grade and in the same school as the teachers in the experimental group. This population was chosen as a control on the fact that subjects in the experimental group might be influenced in both their attitudes and behavior by constraints in the immediate teaching environment which could mediate the effects of the workshop/course.

The researcher attended a session of Education 861, distributed pre-questionnaires to those who met the criteria and who agreed to participate, and collected the information the same day. The second sub-group was contacted by mailing the pre-questionnaire with an explanatory letter (see Appendix G) and stamped, self-addressed envelope for it's return. A follow-up letter and questionnaire were mailed two weeks after the first, and in another two weeks final non-respondents were contacted by telephone. Research participants were those who signed the Human Subjects' consent form, completed and returned the questionnaire. Table 2 indicates the total number in each category for each comparison sub-group. There was not an opportunity to ask the members of the Education 861 class exactly how many of them were practicing teachers (K-12), but it is known that all of them did not meet that requirement and, therefore, were not eligible to participate.

Table 2.--Attendance and research participants for control groups.

Sub-Group	Total Attendance	Practicing Teachers	Research Participants
(Education 861) First sub-group	45		17
(fellow teachers of experimental group) Second sub-group	30	28	13

Thus, the experimental and comparison groups contained equal numbers of subjects, with an attempt to match the comparison groups to the experimental on the factors of attendance in a graduate course and the constraints present in the home teaching situation. This constituted a non-probability, purposive sample.

Data and Instrumentation

The checklist used to assess the variables dealing with objective 1 was developed by the researcher with the aid of a group of in-service teachers in a graduate course in education. That checklist and the interview questions administered to the experimental group at the end of each workshop was submitted to a panel of experts on the faculty of The Ohio State University to determine its validity. The questions on Form F (see Appendix C) refer directly to group

discussions of lesson plans or materials developed by workshop teachers, and refer to the stated objectives and intended activities as expressed by the workshop/course leaders. Form G (Appendix C) was used during activities other than discussions of actual teacher prepared lessons. Again, this form was developed in response to the listed activities and objectives of the sponsors. Form E (Appendix C) contains the questions asked by the researcher during the interview with various participants at the end of each workshop/course, asking them about the materials they developed.

Questionnaires for the ex post facto portion of the study were constructed by the researcher and submitted to a critical jury. Form A (see Appendix C) sought background information similar to that used by other researchers previously cited. The name of the principal and other teachers of the same grade were solicited in order to have that information for establishing the second comparison group and the list of administrators who would also receive questionnaires.

Questions on Form A concerning the definition of environmental education and the subject areas in which it should take place were included in response to stated objectives concerning the definition and philosophy of environmental education.

Items 15 and 16 on Form A solicit the respondent's own and their view of their administrators' attitudes toward environmental education. Numbers 17 and 18 ask for attitudes concerning two specific teaching behaviors, use of materials and equipment other than paper and pencil and use of the out-of-doors. These were included because attitude is assumed to affect behavior and because all of these items reflect questions of the in-service leaders about possible changes in the participants. These questions used the semantic-differential technique which has been verified as a sensitive measure of attitude change (Osgood, 1957; Kerlinger, 1964; and White, 1977). Three paired adjectives were included for each question as recommended by White (1977).

Numbers 19 and 20 on Form A are similar to those on the instrument for Project Outdoors (Oates, 1970) and were intended to assist in the formative evaluation for the benefit of the in-service leaders and sponsors.

Questions 21 through 25 ask for indications of the extent to which certain teaching behaviors related to the in-service objectives took place during the previous school year. The time limitation was established to be sure that all teachers were using the same frame of reference regardless of the length of their teaching experience.

The environmental concepts recorded on Form A are those from Roth's (1969) list of 112 concepts that were

named "acceptable" in his Wisconsin study, and were later submitted to a panel of experts and narrowed to five concepts most important in each of four areas (Bowman, 1972). Of those twenty concepts, Bowman recommended that the two or three named most often in each category be used in this particular study, making a total of nine concepts.

In an attempt to verify each teacher's understanding of those concepts, the section on page 5 of Form A asked respondents to give a short description or example of each concept.

Form B (see Appendix C) was the post-questionnaire sent to all of those who had completed and returned Form A. All of the background questions except teaching assignment were omitted from Form B, since the others should not have changed significantly. All other items on Form B correspond exactly to those on Form A, with the exception of the last section on Form A asking for descriptions of the concepts. This section was deleted before Form B was mailed to the participants. The primary reason for this omission was that, due to different interpretations of the directions, response to that item was very inconsistent. It was also deleted because a number of people indicated to the researcher that they did not feel qualified to respond to that section, thereby lowering the number of respondents in the sample. It also lengthened the questionnaire considerably due to the

amount of time that was required to complete that section. Therefore, in the interest of a higher return and the fact that inconsistency of response made utilization of that data from Form A impossible, the concept description portion was removed from Form B.

The principals' questionnaire, Form C, (see Appendix C) was identical to the teachers' questionnaire on the items requesting a definition of and appropriate subject areas for environmental education, preference for in-service and assistance at school, and attitudes toward environmental education and selected teaching techniques. The principals were asked to respond to the same questions concerning specific teaching behaviors as were included on Forms A and B, in relation to each teacher in their school who had returned a Form A.

Form D (see Appendix C) was sent only to the teachers who had attended the workshop/course and was designed to assess the extent to which specific activities were conducted in the opinion of the participants.

Analysis of the Data

The data collected during the workshops with the aid of checklists were totaled and reported as raw data.

Data from the questionnaires were analyzed using various subprograms from the Statistical Package for the

Social Sciences (SPSS). T-tests were used to test the variability between the two control groups. Reliability of the instrument was tested using STATPAK and verified with PORTAP. Analysis of variance was the procedure used to compare attitudes between the control, experimental, and the principals' groups. Correlated t-tests were used to compare the pre- and post-responses of the control and the experimental groups on attitudes, behaviors and concept usage. Correlations between selected background variables and behaviors and between attitude variables and behaviors were calculated using a Pearson product-moment correlation.

All other data were reported either as frequencies of response in various categories for nominal data or as a mean when dealing with interval data.

Evaluative Model

Figure 1 illustrates the design of the study, which is suggested as an evaluative model for in-service environmental education workshops.

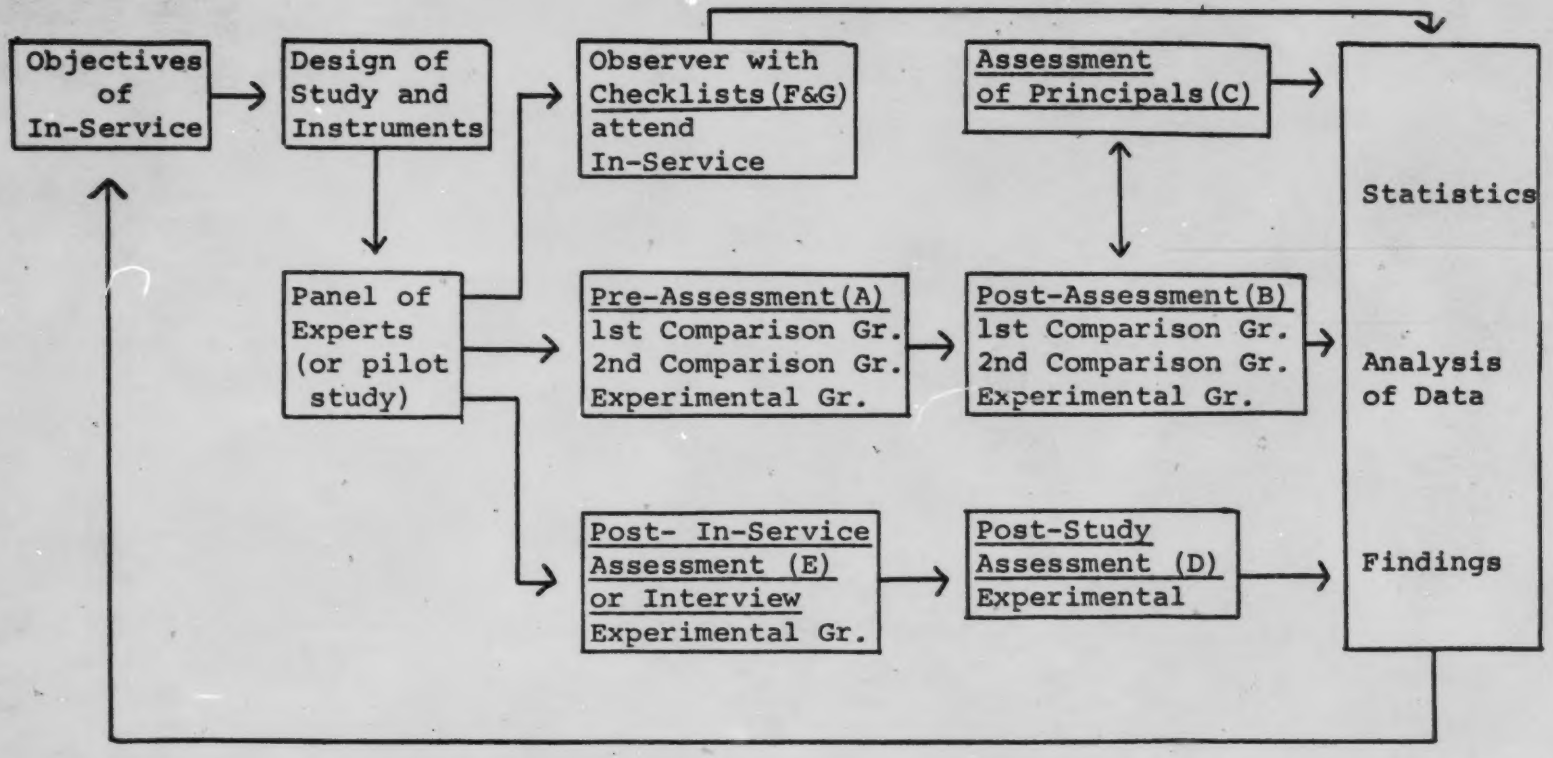


Figure 1.--Evaluative Model

CHAPTER IV

RESULTS AND DISCUSSION

Attendance at the Workshops/Course by the Researcher

Since the dates of the programs overlapped, it was not possible for the researcher to attend every session of each one. Selection of the schedule of attendance was determined by the program of activities and by the ease with which travel and accommodation arrangements could be made. Appendix D contains an account of the actual days spent in each city. The total time the researcher observed the programs was as follows: Dayton, 5 days; Columbus, 7 days; Cleveland, 7 days, and Toledo, 6 days. Appendix C contains Forms E, F, and G, the checklists used by the observer at each session to record activities.

Results of Observer's Checklists

Form G

Form G was designed for use during group activities and, therefore, was the checklist most often completed by the researcher. Frequency tabulations from the compilation of those forms are reported in Table 3.

Table 3.--Frequencies for Form G--Observer's checklist for use at workshop group activities

	Location			
	Dayton	Columbus	Cleveland	Toledo
Number of Observations	5	7	7	6
1) definition of env. ed.		1		1
2) participants def. of env. ed.		1	1	
3) integrate w/subjects			5	2
4) interdisciplinary			1	1
5) concepts				
I 1.	15	3	3	2
I 2.	7		3	1
I 3.			2	
II 4.	2	2	1	1
II 5.	1	4	1	1
III 6.	2	7	3	2
III 7.		7		
IV 8.	10	4	1	
IV 9.	2	3	2	
6) activities mentioned	5	1	1	
explained	9	3	3	2
demonstrated	9	7	5	4
hands-on	13	1	5	1
discovery	4		5	3
process		1		1
subjects incorporated	1	3	6	3

Three of the four programs discussed the definition of environmental education either directly through an explanation by the leader or by encouraging the participants to discuss and formulate their own definition. Dayton was the only situation in which the observer did not record this activity, but it must be pointed out that the researcher was not in attendance on the first day of that program when such a discussion is most likely to occur. Cleveland and Toledo leaders both discussed the inter-disciplinary nature of environmental education and the Cleveland program in particular stressed methods of integrating it with specific subjects.

Although the Columbus course was the only one which listed the development of understanding of concepts as an objective, the other programs conducted group activities which dealt with some of the nine identified concepts at least by suggestion if not directly. The concepts were originally (Roth, 1969) divided into four categories: bio-physical, socio-cultural, management, and change (Table 4). The Dayton leaders seem to have emphasized the "bio-physical" and the "change" concepts predominantly (n. 1, 2, and 8). The strongest area of study in the Columbus program during the days the researcher observed was "management," with less, but about equal time, spent on the "socio-cultural" and the "change" concepts. The Cleveland leaders conducted

Table 4.--Concepts grouped according to four categories

I.--BIO-PHYSICAL

___ 1. Living things are interrelated with one another and their environment.

___ 2. Green plants are the ultimate sources of food, clothing, shelter, and energy in most societies.

___ 3. An organism is the product of its heredity and environment.

II.--SOCIO-CULTURAL

___ 4. The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

___ 5. The relationships between man and the natural environment are mediated by his culture.

III.--MANAGEMENT

___ 6. The management of natural resources to meet the needs of successive generations demands long-range planning.

___ 7. Family planning and the limiting of family also are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.

IV.--CHANGE

___ 8. Organisms and environments are in constant change.

___ 9. The rate of change in environment may exceed the rate of organism adaptation.

activities that covered all four areas fairly evenly. The total number of concepts stressed in the Cleveland program was less than some of the others, perhaps because many of the activities observed there focused on Van Matre's (1972) Acclimatization and awareness objectives rather than on conceptual goals. The sessions observed in Toledo seemed to have the least number of activities which referred to specific concepts, with none recorded in the "Change" section and only a few in the other three.

Each of the programs contained a larger number of activities that were demonstrated than were either just mentioned or explained. "Hands-on" was the most commonly used technique, with "discovery method" second in frequency and the "process approach" used on a very limited basis. The Cleveland workshop had the largest number of subjects incorporated into the activities, and Dayton the least, with the sciences being the most often mentioned approach in all locations.

Form F

Form F was used by the researcher during discussions of lesson plans or materials the participants had developed during the workshops. The teachers in Dayton were not required to write lesson plans or units, therefore, the leaders did not conduct discussions of this nature. As Table 5 shows, each of the other three workshops

Table 5.--Frequencies for Form F--Observer's checklist for use at the workshop discussions of lesson plans or materials

	Dayton	Columbus	Cleveland	Toledo
1) discussion of lessons		1	2	1
2) resource people	3	8	0	3
3) leader assist			2	
4) peer assist		1	1	
5) adapt to class			2	1
6) definition of env. ed.		1		
7) interdisciplinary		4	1	1
8) concepts				
I 1.		4	1	
I 2.		1		2
I 3.			2	
II 4.		1		
II 5.		1		
III 6.				
III 7.		1		
IV 8.		3		
IV 9.				
9) discovery		6	2	
hands-on		8	1	
process				
10) discussion led by		strongly particip.	strongly particip.	partly leader/ partly partici-pant

involved at least some time for group discussions of lessons.

The leader in Cleveland made some suggestions and assisted the participants with their plans. The Columbus teachers' units were required as part of their course work and the professor read and commented on each one. There was some discussion among the participants themselves about their work at both the Columbus and the Cleveland workshops. In Cleveland and Toledo suggestions were made for ways to adapt the materials to specific classroom use. Some of the teachers in each location attempted to make their lessons interdisciplinary, but only the people in Columbus included more than one or two of the concepts in their plans. As with the activities led by the workshop leaders, the discussions of specific lessons tended to involve "hands-on" and "discovery" methods more than the"process approach."

Form E

This form was developed to use in interviewing individual teachers concerning the lessons they had written for use with children during the workshop. Only the participants in Cleveland and Toledo actually worked with children, so the data pertain only to them (Table 6).

Five teachers in Cleveland and seven in Toledo were asked to respond to the questions. Four in each location had written out their lesson plans. Twelve of the 13 goals

Table 6.--Frequencies for Form E--Observer's checklist for use at the workshops; lesson plans for use with children during the workshops

	Cleveland	Toledo
NUMBER OF TEACHERS INTERVIEWED	5	7
1) written plans	4	4
2) goals/objectives		
cognitive	3	2
affective	3	4
behavioral	1	0
3) plans include:		
materials	0	0
directions	4	4
questions	0	0
evaluation	3	2
4) concepts		
1.	3	
2.		
3.		
4.		
5.		
6.		
7.		
8.	1	
9.		
5) activities prepared by:		
teacher	3	5
workshop leaders	0	2
commercial materials	5	4
6) hands-on	5	6
7) discovery learning	4	5
8) process approach	1	2
9) lesson used with children:		
as prepared	2	3
slightly modified	3	4
moderately modified	0	0
changed completely	0	0
10) teacher's assessment of lesson	$\bar{X}$	$\bar{X}$
very pleased - - - - very dissatisfied	3.4	3.8

they named focused on the cognitive and affective domains. The plans were mostly outlines of directions with a total of five including a means of evaluation. Only the teachers in Cleveland wrote plans that involved any of the nine concepts, with three-fourths of those dealing with concept number 1.

Most teachers reported that the plans they used were a combination of commercial materials that they had adapted to fit their particular situation. Two of the teachers in Toledo used ideas or plans suggested by the leader from the Aullwood Farm staff.

Again, the lessons the teachers used themselves seemed to involve "hands-on" (11) and "discovery learning" (9) more than the "process approach" (3).

All of the teachers taught their lessons either just as they were prepared or only slightly modified.

The last question they were asked was to rank their satisfaction with the lesson on a scale of 1-5. The mean for the Cleveland teachers was 3.4 and for Toledo was 3.8.

Results of Form D Section of the Post-questionnaires

Form D (see Appendix C) was attached to the post-questionnaires of the workshop participants only, who received and were asked to respond to it in December of 1978. The first seven questions were designed to duplicate the

activities listed in Phase I and Phase II of the Aullwood Audubon Farm workshops (see p. 5) to see to what degree the participants felt those activities actually took place. The last two questions ask them: (1) to assess the materials they developed, and (2) their opinion of having children participate in the workshop. In each question the respondents could check any segment of a five-point semantic differential scale. The blanks were coded for computer analysis with a strong or positive response receiving a 5. The means for each question for each location are given in Table 7.

The Columbus and Cleveland teachers gave a higher rating than those from the other two locations on the questions concerning the definition of environmental education and learning to integrate environmental education with existing subjects. The Cleveland participants all rated their experience at the highest level (strong emphasis) for the latter, while the Toledo respondents gave it an average (3.00) rating.

The Cleveland teachers also unanimously agreed that there was strong emphasis on exploring the resources of the workshop site, and Dayton received a relatively high mean of 4.75 on that variable.

When asked about the emphasis placed on preparing an initial program of instruction, the Columbus and Cleveland

Table 7.--Form D--Experimental teachers by location. Mean scores of activities at the workshops using a semantic differential five-point scale

	Location			
	Dayton	Columbus	Cleveland	Toledo
Number of Respondents	8	6	4	7
QUESTION				
*1. Define environmental education and its philosophy	3.86	4.00	4.25	3.29
2. Learn to integrate EE with existing subjects	3.38	3.67	5.00	3.00
3. Explore the resources of the workshop site	4.75	4.33	5.00	3.43
4. Prepare an initial program of instruction	2.13	5.00	4.75	2.71
5. Evaluate and discuss these programs or lessons	2.38	4.00	4.00	2.43
6. Discuss means for adapting plans for use in class	2.88	3.50	4.25	2.57
7. Use of outside resource people	4.25	4.33	4.25	4.00
8. In general, how do you feel about the materials you developed during the workshop?				
strong--weak	3.63	4.83	4.50	3.00
useful--not usable	4.13	4.83	4.25	3.00
pleased--dis-satisfied	3.88	4.83	4.25	3.00

Table 7.--Continued

	Location			
	Dayton	Columbus	Cleveland	Toledo
9. How did you feel about having children participate in the workshop?				
beneficial-harmful	4.25	4.25	3.75	3.14
unnecessary--necessary	3.75	3.50	3.25	2.57
encouraging--discouraging	4.00	4.00	3.75	2.71

*Questions 1-7 each used choices of:
strong emphasis (5) - - - - no emphasis (1)

workshops again received the highest mean scores. Dayton was the lowest on this variable as was to be expected, since the objectives of that program did not include having the participants write or use lesson plans during the workshop. The strongest emphasis upon evaluating and discussing those plans was again in Columbus and Cleveland, according to the participants, with a mean of 4.00 each. The Cleveland teachers rated the emphasis upon discussing ways for adapting plans for use in the class even higher (4.25). The Toledo teachers seemed to feel that there was much less emphasis on the latter two variables (questions 5 and 6) in their workshops, since their mean scores were 2.43 and 2.57, respectively.

All four programs seemed to place about an equal amount of time on the use of outside resource people, with the means ranging between 4.00 and 4.33.

Question 8 asked the teachers to rate the materials they developed during the workshop with three paired adjectives on a semantic differential scale. Again, the responses were coded so that a check in the most positive position received a score of 5. The Columbus participants were the most positive about their materials, with Cleveland, Dayton and Toledo following in that order. This question was very similar to the one asked of the Cleveland and Toledo teachers interviewed at the end of their summer

experience (see page 46). The average score of the Cleveland teachers at that time was 3.4, and that of the Toledo people was 3.8. After a lapse of four and a half months, the average of the means on Form D (Table 7) concerning their reaction to their lessons was higher for the Cleveland group (4.33), but lower for Toledo (3.19).

The last item on Form D asked the participants to again respond to three paired adjectives on a five-point semantic differential scale concerning their reactions to having children participate in the workshops. It is interesting to note that the mean scores were higher from the Dayton and Columbus respondents, who did not actually work with children during their workshops, than it was for the Cleveland and Toledo teachers. The Cleveland participants rated their experience with children as more beneficial, necessary and encouraging than did the Toledo teachers.

Summary

In general, it seems that there was only a moderate amount of emphasis on defining environmental education in the four workshops. The Cleveland program gave the most attention to learning to integrate environmental education with existing curriculum. The participants in Cleveland and Columbus both felt there was strong emphasis on preparing an initial program of instruction. The Columbus teachers

were the most and Cleveland the second most positive about their materials. The Dayton workshop spent the most time dealing with concepts, with those in the "bio-physical" and the "change" categories used most often. The Columbus in-service program dealt with the "management" group more than any of the others. Both leaders and teachers tended to use a "hands-on" approach to a greater extent than "discovery" or "process approach." Teachers in Cleveland and Toledo, who worked with children during their programs, gave moderate rating to this experience in terms of whether or not it was beneficial, necessary and encouraging.

Response to Instruments

As previously detailed, Form A was the pre-questionnaire for teachers to which 30 people responded forming a control group (17 from the first comparison groups and 13 from the second comparison group), and another 30 forming an experimental group.

Form B was the post-questionnaire sent to the above 60 respondents. There were 27 people (90 percent) from the control group, and 25 (83 percent) from the experimental group who returned Form B. Of the 8 non-respondents, three from the experimental group were found to be no longer teaching.

Form D was included along with Form B for the teachers in the experimental group and 25 completed instruments were returned.

Of the 43 principals who were sent Form C, 30 (70 percent) returned them completed. Three people returned the forms saying they did not care to participate.

Appendix E contains the outline used to categorize and code responses on questionnaires A, B, C and D for computer analysis.

Preference for Emphasis at Workshops and Assistance at School

Forms A, B, and C all contained a question in which the respondents were to check two of the five items as the ones they preferred to have emphasized at an environmental education workshop for teachers. Table 8 shows the frequency with which each item was chosen. The "no response" row indicates the number of subjects who only checked one item and whose missing choice was coded as a non response. It can be seen by looking at the totals for each item that "teaching methods" seemed to be the highest and "resource materials" the second highest preference for emphasis at environmental education workshops. Strengthening of skills (use of microscope, etc.) was the lowest priority for the items listed. "Personal understandings" ranks slightly

higher than "concepts" but the two are relatively close in the number of times chosen.

Table 8.--Frequencies for control, experimental, and principals' groups on the variable concerning preference for emphasis at environmental education workshops

	Control		Experimental		Principals	Totals
	pre	post	pre	post		
1. Concepts	14	8	7	2	15	46
2. Skills	4	7	8	7	2	28
3. Resource Materials	11	16	19	7	17	70
4. Personal understandings	14	8	11	10	12	55
5. Teaching Methods	17	15	15	22	14	83
No Response	0	0	0	2	14	
Total Responses	60	54	60	50	74	

Experimental subjects rated "resource materials" highest on the pre-questionnaire, while that item dropped to third priority on the post-questionnaire with "teaching methods" far outranking the others. This seems to indicate that they either had been exposed to a number of resource materials at the workshops or that they felt more emphasis should have been placed upon teaching methods during the in-service. Since this question did not refer directly to

the experience of the teachers in the workshops, it is difficult to determine which interpretation is better. The principals gave relatively equal weight to items 1, 3, 4 and 5 and chose "concepts" more than any teacher group.

Table 9 gives the frequency with which each item was chosen for the Form A, B and C question regarding assistance most valuable in utilizing environmental education at school. Again, the respondents were to check two items with the unused choice for those who only marked one item coded as no response.

Table 9.--Frequencies for control, experimental, and principals' groups on the variable concerning assistance most valuable in using environmental education at school

	Control		Experimental		Prin-	
	pre	post	pre	post	cipals	Totals
1. Planning lessons	14	15	9	10	12	60
2. School site study or development	12	8	12	13	14	59
3. Specialists and consultants	16	8	18	9	16	67
4. Materials and equipment	17	21	20	17	14	89
No Response	0	2	1	1	18	
Total Responses	60	54	60	50	74	

The raw totals indicate that "materials and equipment" received the most emphasis with the other items being chosen approximately the same number of times. There was no clear-cut difference among the groups as to their preference on this question. The principals were relatively evenly divided on their choices with "specialists and consultants" named only slightly more often than the other items.

In conclusion, it appears that on the questions referring to preference for emphasis at an environmental education workshop and assistance with environmental education at school, "teaching methods," "resource materials," and "materials and equipment" were the favored choices with control teachers, experiemental teachers, and principals all in relative agreement as to the ranking of those choices.

Comparison of Groups on Background Variables

Since the design of the study designated three distinct teachers' groups: experimental, first comparison, and second comparison, it was necessary to determine to what extent those groups were alike or different on selected variables.

Subjects' responses to the Form A background questions were used to examine group similarity. Those variables were: grade taught, subject taught, number of

teachers on team, undergraduate major, graduate degree, graduate major, number of years of teaching experience, and amount of exposure to environmental education workshops or courses.

Appendix F contains the raw data for each of the categories in the background variables for each control group and the experimental group.

Similarity of Two Comparison Groups

Table 10 reports results of the t-test analysis concerning the background variables for comparison groups 1 and 2. Since one of the underlying assumptions of the t-test between groups is that the variances are equal, the F values obtained as a result of comparing these variances and the corresponding two-tail probabilities have been included. If the variances are unequal [F is significant at the designated α level (0.05)], H_o is rejected and the t-value based on the separate variance estimate is reported. If the variances are equal [F is not significant at the designated α level (0.05)], H_o is not rejected and the t-value is based on a pooled variance estimate.

First the two comparison groups were subjected to an F-test for the eight variables examined. The hypotheses for those variables were as follows:

Table 10.--T-test for two control groups on background variables

	Mean	Std. Deviation	F Value	2-Tail Prob.	Pooled Variance Est. T Value	2-Tail Prob.	1-Tail Prob.
Grade Taught							
Group 1	2.76	0.90	1.12	0.82	0.46	0.65	0.33
Group 2	2.92	0.95					
Subject Taught							
Group 1	2.00	1.17	2.38	0.13	0.21	0.84	0.42
Group 2	1.92	0.76					
Team Teachers							
Group 1	0.41	0.62	1.66	0.38	0.50	0.62	0.31
Group 2	0.31	0.48					
Undergrad. Major							
Group 1	2.76	1.75	2.47	0.12	1.23	0.23	0.12
Group 2	2.08	1.12					
Graduate Degree							
Group 1	2.12	0.33	2.09	0.17	2.87	0.01	0.005[b]
Group 2	1.69	0.48					
Graduate Major							
Group 1	2.76	0.75	6.28	0.002	0.52	0.62[a]	0.31
Group 2	3.13	1.89					
Years Teaching							
Group 1	1.65	1.00	1.08	0.92	2.04	0.05	0.03[b]
Group 2	2.38	0.96					
Env. Ed Workshops							
Group 1	1.88	1.11	1.33	0.59	0.08	0.94	0.47
Group 2	1.85	1.28					

Table 10.--Continued

Group 1 - first comparison group (Fundamentals of Supervision class)

Group 2 - second comparison group (teachers in the home schools of the experimental group teachers)

[a]Separate Variance Estimate rather than Pooled Variance Estimate.

[b]$P \leq 0.05$

Grade taught	$H_o: S_1^2 - S_2^2$	$H_i: S_1^2 \neq S_2^2$
Subject taught	$H_o: S_3^2 - S_4^2$	$H_i: S_3^2 \neq S_4^2$
Team Teachers	$H_o: S_5^2 - S_6^2$	$H_i: S_5^2 \neq S_6^2$
Undergrad Major	$H_o: S_7^2 - S_8^2$	$H_i: S_7^2 \neq S_8^2$
Graduate Degree	$H_o: S_9^2 - S_{10}^2$	$H_i: S_9^2 \neq S_{10}^2$
Graduate Major	$H_o: S_{11}^2 - S_{12}^2$	$H_i: S_{11}^2 \neq S_{12}^2$
Years Teaching	$H_o: S_{13}^2 - S_{14}^2$	$H_i: S_{13}^2 \neq S_{14}^2$
Env. Ed. Workshop	$H_o: S_{15}^2 - S_{16}^2$	$H_i: S_{15}^2 \neq S_{16}^2$

In examining the data from the two comparison groups, the only variable for which F is significant is the one pertaining to "graduate major." Therefore, $H_o: S_{11}^2 - S_{12}^2$ is rejected and the other seven null hypotheses are not rejected, indicating that their variances are equal. "Graduate major" is not interval data, so the unequal variance merely indicates that they are not identical for the two groups. As the raw data in Appendix F shows, the first comparison groups has the majority of respondents in the Early and Middle Childhood, Master's in Teaching, or Curriculum and Administration areas. The largest category for the second comparison group is in the social sciences and the "no response" or no graduate major category.

Next, the t-values obtained from the analysis of the differences in the group means on each variable must be considered. The hypotheses for the differences in the means are as follows:

Grade Taught	$H_o: \bar{X}_1 = \bar{X}_2$	$H_i: \bar{X}_1 \neq \bar{X}_2$
Subject Taught	$H_o: \bar{X}_3 = \bar{X}_4$	$H_i: \bar{X}_3 \neq \bar{X}_4$
Team Teachers	$H_o: \bar{X}_5 = \bar{X}_6$	$H_i: \bar{X}_5 \neq \bar{X}_6$
Undergrad Major	$H_o: \bar{X}_7 = \bar{X}_8$	$H_i: \bar{X}_7 \neq \bar{X}_8$
Graduate Degree	$H_o: \bar{X}_9 = \bar{X}_{10}$	$H_i: \bar{X}_9 \neq \bar{X}_{10}$
Graduate Major	$H_o: \bar{X}_{11} = \bar{X}_{12}$	$H_i: \bar{X}_{11} \neq \bar{X}_{12}$
Years Teaching	$H_o: \bar{X}_{13} = \bar{X}_{14}$	$H_i: \bar{X}_{13} \neq \bar{X}_{14}$
Env. Ed. Workshop	$H_o: \bar{X}_{15} = \bar{X}_{16}$	$H_i: \bar{X}_{15} \neq \bar{X}_{16}$

As with the F values, if the t-value is significant at the designated α level (0.05), H_o is rejected. If the t-value is not significant at the designated α level, H_o is not rejected.

By looking at the 1-tail probability column in Table 10, it can be noted that two variables, "graduate degree" and "years teaching", are significantly different at the specified α level. Therefore, $H_o: \bar{X}_9 = \bar{X}_{10}$ and $H_o: \bar{X}_{13} = \bar{X}_{14}$ are rejected because the means of the two comparison groups are significantly different on the two variables, with the first group having more people with graduate degrees and the second having a higher mean for years of experience. The other six null hypotheses are not rejected and the means are assumed not to be significantly different.

In conclusion, the variances for the two groups are equal on all variables but "graduate major." There is a

significant difference in means for the "graduate degree" and the "years teaching" variables. This is not especially surprising since the Fundamentals of Supervision class is primarily intended for people in curriculum and administration. Thus, that group probably contains a higher percentage of teachers with or pursuing graduate degrees in those fields than is found in the general teaching populace, which is more typically represented by the second comparison group. The fact that the mean number of years of teaching experience is higher for the second comparison group is again probably related to the fact that the first group is comprised of more teachers in a graduate degree-oriented program, who might tend to follow such a course at a younger age. In general, however, the variances and means for the two groups are not significantly different on the majority of the variables. They are also similar in variance and means for the amount of exposure to environmental education workshops, which is a major consideration for this research. Therefore, they are assumed to be similar enough to be treated as one group for the purposes of this study.

Similarity of Control and Experimental Groups

Since the relative similarity of the two comparison groups on background variables has been established, they

are henceforth treated as one group. It is now necessary to determine to what extent this group is comparable to the experimental group. Again, the subjects' responses on Form A to the background questions were used to test variability using a t-test procedure for the eight variables. (See appendix F for the raw data for each group on these variables.)

The hypotheses for the variances were as follows:

Grade Taught	$H_o: S^2_{17} = S^2_{18}$	$H_1: S^2_{17} \neq S^2_{18}$
Subject Taught	$H_o: S^2_{19} = S^2_{20}$	$H_1: S^2_{19} \neq S^2_{20}$
Team Teachers	$H_o: S^2_{21} = S^2_{22}$	$H_1: S^2_{21} \neq S^2_{22}$
Undergrad. Major	$H_o: S^2_{23} = S^2_{24}$	$H_1: S^2_{23} \neq S^2_{24}$
Graduate Degree	$H_o: S^2_{25} = S^2_{26}$	$H_1: S^2_{25} \neq S^2_{26}$
Graduate Major	$H_o: S^2_{27} = S^2_{28}$	$H_1: S^2_{27} \neq S^2_{28}$
Years Teaching	$H_o: S^2_{29} = S^2_{30}$	$H_1: S^2_{29} \neq S^2_{30}$
Env. Ed. Workshop	$H_o: S^2_{31} = S^2_{32}$	$H_1: S^2_{31} \neq S^2_{32}$

Table 11 reports the data concerning the background variables for the control and the experimental groups. If the variances are unequal [F is significant at the designated α level (0.05)], H_o is rejected and the t-value based on the separate variance estimate is reported. If the variances are equal [F is not significant at the designated α level (0.05)], H_o is not rejected and the t-value is based on a pooled variance estimate.

Table 11.--T-test for control and experimental groups on background variables

	Mean	Std Deviation	F Value	2-Tail Prob.	Pooled Variance Est. T Value	2-Tail Prob.	1-Tail Prob.
Grade Taught							
Control	2.83	0.91	1.27	0.52	2.52	0.015	0.008[b]
Exper.	2.20	1.03					
Subject Taught							
Control	1.97	1.00	1.87	0.10	0.43	0.67[a]	0.34
Exper.	1.83	1.37					
Team Teachers							
Control	0.37	0.56	1.10	0.80	0.68	0.50	0.25
Exper.	0.27	0.58					
Undergrad. Major							
Control	2.47	1.53	1.35	0.43	0.63	0.53	0.27
Exper.	2.20	0.77					
Graduate Degree							
Control	1.93	0.45	1.34	0.43	1.59	0.12	0.06
Exper.	1.73	0.52					
Graduate Major							
Control	2.88	1.20	1.10	0.84	2.35	0.02	0.01[b]
Exper.	2.05	1.15					
Years Teaching							
Control	1.97	1.03	1.37	0.41	1.15	0.26	0.13
Exper.	2.30	1.21					
Env. Ed. Workshops							
Control	1.87	1.17	1.02	0.96	0.22	0.83	0.42
Exper.	1.80	1.16					

[a]Separate Variance Estimate rather than Pooled Variance Est.

[b]$P \leq 0.05$

The only area for which the difference in variance is significant is that of "subject taught," so $H_o: S_{19}^2 = S_{20}^2$ is rejected and the other seven null hypotheses for the comparison of variances are not rejected. Since "subject taught" is not interval data, an examination of the raw data in Appendix F is necessary. More of the experimental group teachers have self-contained classes, while more control teachers are in social studies or language arts. This difference is probably due to the factor "grade taught," which will be discussed next.

The hypotheses for the difference in means are as follows:

Grade Taught	$H_o: \bar{X}_{17} = \bar{X}_{18}$	$H_1: \bar{X}_{17} \neq \bar{X}_{18}$
Subject Taught	$H_o: \bar{X}_{19} = \bar{X}_{20}$	$H_1: \bar{X}_{19} \neq \bar{X}_{20}$
Team Teachers	$H_o: \bar{X}_{21} = \bar{X}_{22}$	$H_1: \bar{X}_{21} \neq \bar{X}_{22}$
Undergrad. Major	$H_o: \bar{X}_{23} = \bar{X}_{24}$	$H_1: \bar{X}_{23} \neq \bar{X}_{24}$
Graduate Degree	$H_o: \bar{X}_{25} = \bar{X}_{26}$	$H_1: \bar{X}_{25} \neq \bar{X}_{26}$
Graduate Major	$H_o: \bar{X}_{27} = \bar{X}_{28}$	$H_1: \bar{X}_{27} \neq \bar{X}_{28}$
Years Teaching	$H_o: \bar{X}_{29} = \bar{X}_{30}$	$H_1: \bar{X}_{29} \neq \bar{X}_{30}$
Env. Ed. Workshop	$H_o: \bar{X}_{31} = \bar{X}_{32}$	$H_1: \bar{X}_{31} \neq \bar{X}_{32}$

In examining the t-values comparing the difference in the means of the two groups, "subject taught" (where the variance was significantly different) has a 1-tail probability of 0.34, or no significant difference in the means. However, the t-value 1-tail probabilities for "grade taught"

and for "graduate major" are significant. For that reason, $H_o: \bar{X}_{17} = \bar{X}_{18}$ and $H_o: \bar{X}_{27} = \bar{X}_{28}$ are rejected, but the null hypotheses for the differences in means for the other six variables are not rejected.

The group means for the variable "grade taught" are as follows:

First comparison group (Fundamentals of Supervision class) - 2.76

Second comparison group (fellow teachers of experimental group) - 2.92

Combined comparison groups - 2.83

Experimental group - 2.20

Sixty-five names were listed on the completed Form A's by the experimental teachers as being teachers in their same grade in their school. Thirty of those people were chosen using a table of random numbers and solicited to participate in the study. Theoretically they should have had the same distribution throughout the range of grades K through 12 as the experimental teachers. Thirteen of the 30 returned Form A, and it can be seen from the above means that more of those 13 respondents were from the upper grade levels than were the experimental teachers. No logical explanation for this discrepancy can be found.

The first comparison group, from the Fundamentals of Supervision class, also has a higher mean for "grade taught" than the experimental group. Due to the constraints of the

situation in which those participants were solicited, it is not possible to know whether the class was simply heavily weighted with upper level teachers or whether, again, those teachers tended to be more willing to participate.

The fact remains, however, that the combined comparison groups have a significantly higher mean for "grade taught" than the experimental group and that factor must be taken into consideration where it is appropriate.

Although the number of subjects with graduate degrees is not significantly different between the control and the experimental groups (Table 11), there is a difference in the "graduate major" for the groups at the 0.01 level. Various fields of study cannot readily be converted into interval data. The raw data for each group on that variable are presented in Table 12 and explain the difference in means of the two groups. There is not a great deal of difference in environmental education or science/math education, which is the main area where a large discrepancy might influence the results of this study.

In conclsuion, the comparison of the control group and the experimental group on background variables reveals that the only significant difference in variance is for "subject taught," but the difference in means based on a separate variance estimate for that variable is not significant. The t-values for differences in means based

Table 12.--Frequencies for "graduate majors" for control and experimental groups

	Control	Experimental
1. Environmental education, science & math education	3	6
2. EMC, MAT, secondary education	7	11
3. Curriculum, administration	7	1
4. English, reading, history, fine art, applied arts	7	0
5. Special education, physical education	0	2
6. Combination	1	0

on pooled variance estimates indicate two significant differences--"grade taught" and "graduate major." An examination of the raw data shows only a small difference in the number of people majoring in environmental education or science/math education, which tend to be most closely related to the subject of this study. The fact that the control group contains a higher proportion of upper level teachers than the experimental group is a factor which must be taken into consideration in the interpretation of the data.

Reliability of the Instrument

The reliability of the instrument was determined using Fortran Test Analysis Package (FORTAP) and verified using STATPACK (REL) and found to be 0.797 on both analyses.

Definition of Environmental Education

Forms A, B and C asked the respondents in comparison, experimental, and principals' groups to give their definition of environmental education. This was an open-ended question for which the responses were copied onto another form with code numbers beside them to identify their author's group. Similar words and phrases were noted and tabulated. The cognates fell into ten categories, which are listed in Table 13. Table 14 gives the percentage of respondents in each group who included a term from each of the ten cognate categories in their definition.

Category 3, which refers to surroundings or the environment, was the most frequently named category with an overall of 90 percent. It was mentioned by the highest number of respondents in every case except the pre-questionnaire control group where those cognates were second in frequency to category 1. The latter includes terms relating to education or learning and was second in order of overall frequency with 82 percent. Category 5, containing pronouns or personal references, was included by an average of

Table 13.--Categories of cognates used by respondents in defining environmental education

Category	Terms
1	Teach, educate, learn, study, knowledge, understand, helping, provide experience, show, making
2	Concern, awareness, appreciate, relate to, attitudes, develop respect, essential point, wonderful, role, values, environmental concerns, influence lives
3	Surroundings, environment, outdoors, nature, organic and inorganic, everything around us, living and non-living, social and physical, natural resources, earth, space
4	interrelationships, how it affects us, we affect it, interaction, interdependence, co-exist, functions and purposes, processes, relationships, nature's balance, live in harmony
5	Your, children, student's, man's, individual, we people, they, his, us person, our, students and teachers
6	Benefit, preserve, protect, use effectively, save, maintain, conserve, make better use of, take care of, future generations, causes, consequences, strive to improve, just use, utilize
7	First-hand experiences, teaching with and about, environment as source of learning, as many experiences as possible
8	Multifaceted discipline, interdisciplinary, ever-changing discipline, all subjects, social and natural sciences, concepts
9	Cope with, problems and solutions
10	Ecology

Table 14.--Percentage of control, experimental, and principals' groups including various categories of cognates in their definitions of environmental education

Categories	Control		Experimental		Principals	Mean
	Pre	Post	Pre	Post		
1	93	92	86	73	67	82.2
2	36	12	43	36	22	29.8
3	86	96	96	86	85	89.8
4	61	44	50	50	30	47.0
5	68	86	57	73	70	70.8
6	18	24	21	18	41	24.4
7	4	8	4	5	7	5.6
8	7	0	11	9	4	6.2
9	11	0	4	0	0	3.0
10	0	0	0	0	7	1.4
Total Respondents	30	27	30	26	30	

71 percent of the respondents. Interrelationships or interdependence (Category 4) was named by less than half (47 percent) of the subjects in their definition. Concern and awareness (Category 2) and protecting or conserving (Category 6) were included by approximately 25 percent of the respondents. The last four categories were identified by very few people. These involved concrete learning experiences (Category 7) and the fact that environmental education is interdisciplinary (Category 8).

There was no real discrepancy between either of the teachers' groups or the principals as to their definition of environmental education. In each case, Categories 3, 1, and 5 were by far the most often used, with Categories 4, 2, and 6 following next, and 7, 8, 9, and 10 least mentioned. Therefore, "education about the human environment" seemed to be the primary definition of environmental education by teachers and principals.

Subject Areas for Environmental Education

Another question on Forms A, B, and C was "In what subject area(s) do you feel environmental education should take place?" Table 15 reports the frequency of responses in each category for the control, experimental, and principals' groups with both pre- and post-questionnaire answers.

Sixty-two respondents said that environmental education should be incorporated into all subjects--a response level almost twice that indicated for any other category. Science, math, and social studies were listed singly or as a group by 34 people. No responses were recorded solely in Category 3 (language and fine or applied arts) or Category 4 (physical education or health). Category 5 included those people who named individual subjects which crossed the disciplines in the preceding

categories but who did not simply state that all subjects should be involved with environmental education. Only three respondents said that environmental education should be a separate discipline. All groups tended to respond in a similar manner following the general trend of the overall totals.

Table 15.--Frequencies for control, experimental, and principals' groups concerning subject areas for environmental education

	Control		Experimental		Principals	Totals
	Pre	Post	Pre	Post		
1) All subjects	13	12	12	15	10	62
2) Science, math social studies	9	8	8	3	6	34
3) Language arts, fine or applied arts	0	0	0	0	0	0
4) Physical education, health	0	0	0	0	0	0
5) 3 or more listed singly	4	6	7	5	10	32
6) Separate discipline	0	0	0	1	2	3
No response	4	4	3	6	9	26

One Way Analysis of Variance

Three attitude questions were common to Forms B and C or the post-questionnaire for teachers and the instrument

for principals. For each question three bipolar adjectives were presented with five blanks between them for the level of response. The questions were as follows:

How does the administration in your district ["you" on Form C] feel about including environmental education in the curriculum?

encourage	- - - - -	discourage	(1)
negative	- - - - -	positive	(2)
important	- - - - -	unimportant	(3)

How do you feel about students working with materials and equipment other than paper and pencil in the classroom?

beneficial	- - - - -	harmful	(4)
difficult	- - - - -	easy	(5)
not important	- - - - -	important	(6)

How do you feel about taking your students out-of-doors for lessons?

beneficial	- - - - -	harmful	(7)
important	- - - - -	not important	(8)
easy	- - - - -	difficult	(9)

To determine whether significant differences existed between the control, experimental, and principals' groups, the analysis of variance procedure was used. In addition, the post hoc Scheffé test was performed to indicate which differences between the means could be considered significant at the 0.05 level. Table 16 reports the means and standard deviations for the three respondents' groups on each of the above nine variables.

The results of the analysis of variance for the first three variables are reported in Table 17. The means for (1) "administration encourage/discourage" were: control, 3.96; experimental, 3.76; and principals, 4.50. The ANOVA showed

that this difference between groups is significant at the 0.006 level. The post hoc Scheffé test (see Table 18) revealed that this was due primarily to the difference in means of the experimental and the principals' groups.

Table 16.--Means and standard deviations for one way analysis of variance for nine attitudinal variables

	Control		Experimental		Principals	
	Mean	S.D.	Mean	S.D.	Mean	S. D.
1) ADMENC	3.96	0.90	3.76	1.09	4.50	0.57
2) ADMPOS	3.96	0.90	4.00	0.83	4.43	0.73
3) ADMINP	3.81	0.92	3.71	0.91	4.30	0.70
4) MATBEN	4.93	0.27	4.68	0.63	4.87	0.35
5) MATEAS	3.19	1.27	3.67	1.09	3.47	0.78
6) MATIMP	4.85	0.46	4.67	0.64	4.50	0.57
7) OODBEN	4.67	0.55	4.68	0.56	4.73	0.52
8) OODIMP	4.33	1.00	4.46	0.72	4.40	0.77
9) OODEAS	3.04	1.13	3.33	1.05	3.40	1.07

Table 17.--One way analysis of variance tables for experimental, control, and principals' groups on three administrator's attitude variables

	d.f.	sum of squares	mean squares	F ratio	F prob.
ADMENC					
between groups	2	8.20	4.10	5.49	0.006[a]
within groups	79	59.02	0.75		
total	81	67.22			
ADMPOS					
between groups	2	3.89	1.95	2.90	0.06
within groups	78	52.33	0.67		
total	80	56.22			
ADMINP					
between groups	2	5.56	2.78	3.92	0.02[a]
within groups	78	55.33	0.71		
total	80	60.89			

(1) Administration encourages/discourages environmental education--ADMENC
(2) Administration is positive/negative toward environmental education--ADMPOS
(3) Administration feels environmental education is important/not important--ADMINP

[a] $P \leq 0.05$

The ANOVA indicated that the means for (2) "administration negative/positive" were not significantly different at the 0.05 level, but were relatively close (0.06). The post hoc Scheffé reveals that the main difference on this variable was (Table 18) between the teachers' and the principals' groups.

Table 18.--A Posteriori Contrasts Scheffé's test (unequal N's) for control, experimental, and principals' groups on two administration's attitude variables

ADMINISTRATION ENCOURAGES/DISCOURAGES ENVIRONMENTAL ED.

$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_3$	
3.963	3.760	4.500	$\bar{X}_1$ 3.963
-	0.203	0.537	$\bar{X}_2$ 3.760
-	-	0.740*	$\bar{X}_3$ 4.500
-	-	-	

*P ≤ 0.05 Mean differences (Ψ) required for statistical significance at the 0.05 level--

Ψ_{12} = 0.598
Ψ_{23} = 0.575
Ψ_{13} = 0.570

ADMINISTRATION FEELS ENVIRONMENTAL ED. IS IMPORTANT/NOT IMPORTANT

$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_3$	
3.815	3.708	4.300	$\bar{X}_1$ 3.815
-	0.107	0.485	$\bar{X}_2$ 3.708
-	-	0.592*	$\bar{X}_3$ 4.300
-	-	-	

*P ≤ 0.05 Mean differences (Ψ) required for statistical significance at the 0.05 level

Ψ_{12} = 0.591
Ψ_{23} = 0.568
Ψ_{13} = 0.548

$\bar{X}_1$ - control group; $\bar{X}_2$ - experimental group;
$\bar{X}_3$ - principals' group

The third variable in this group, (3) "administration important/unimportant," received a mean of 3.81 and 3.71 for the control and experimental groups respectively, while the mean for the principals was 4.30. The ANOVA calculated this difference as significant at the 0.02 level. The post hoc test supported the fact that there was a significant difference in the means of the experimental and the principals' groups on this variable.

Tables 19 and 20 contain the ANOVA results for the differences in means of the control, experimental, and principals' groups on the remaining six attitude variables pertaining to the use of materials other than paper and pencil and the practice of taking students out-of-doors. There was no significant difference between groups for any of those variables, although a relatively close 0.065 level was found for variable (6), "working with materials other than paper and pencil important/not important." The post hoc analysis also obtained a result that was close to a significant difference between the control and the principals' groups on this variable.

In conclusion, it would seem that the teachers' groups and principals agree on the importance, benefits, and ease of both using materials and equipment other than paper and pencil in the classroom and of taking students out-of-doors for lessons. However, there was a significant

difference in the importance and encouragement of environmental education by the administration as reported by the principals themselves and by the teachers' interpretation of their administrators' feelings on those two variables.

Table 19.--One way Analysis of Variance tables for experimental, control, and principals' groups on three variables concerning materials other than paper/pencil

	d.f.	sum of squares	mean squares	F ratio	F prob.
MATBEN					
between groups	2	0.85	0.43	2.28	0.11
within groups	79	14.76	0.19		
total	81	15.61			
MATEAS					
between groups	2	3.00	1.50	1.35	0.27
within groups	78	86.88	1.11		
total	80	89.88			
MATIMP					
between groups	2	1.76	0.88	2.83	0.065
within groups	78	24.24	0.31		
total	80	26.00			

Feel about students working with materials--
(4) beneficial/harmful--MATBEN
(5) easy/difficult--MATEAS
(6) important/not important--MATIMP

Table 20.--One way Analysis of Variance tables for experimental, control, and principals' groups on three variables concerning taking classes out-of-doors

	d.f.	sum of squares	mean squares	F ratio	F prob.
OODBEN					
between groups	2	0.07	0.04	0.12	0.89
within groups	79	23.31	0.30		
total	81	23.38			
OODIMP					
between groups	2	0.20	0.10	0.14	0.87
within groups	78	55.16	0.71		
total	80	55.36			
OODEAS					
between groups	2	2.06	1.03	0.88	0.42
within groups	78	91.50	1.17		
total	80	93.56			

(7) Taking students out-of-doors - beneficial/harmful--OODBEN
(8) important/not important--OODIMP
(9) easy/difficult--OODEAS

Correlated t-tests

Correlated t-tests were computed to compare the Form A and B (pre- and post-) responses to individual variables for both the control and the experimental groups. This section contains the results of those tests.

Attitude Variables

On all of the attitude variables the respondents were to place a check along a five-point continuum between three pairs of bipolar adjectives in response to a question (see Appendix C for a copy of the instruments). They were coded before being analyzed with the most positive space assigned a score of five. (See Appendix E for the coding sheet.)

The first set of variables dealt with how the administration in the district feels about including environmental education in the curriculum. As Table 21 shows, the mean scores of both the control and the experimental groups for the encourage/discourage pair of adjectives increased from pre to post but not to a significant degree. The means for both groups also increased slightly for the positive/negative adjective pair. Although the 1-tail probability for the experiemental group was relatively close (0.08), neither group had better than a 0.05 level of significance. The same was true for the important/unimportant choice.

The next question for which there were three paired adjective responses was, "How do you feel about teaching environmental education in your classroom?" Table 22 contains the results of the correlated t-tests for these variables. The t-values for the necessary/unnecessary and

Table 21.--Correlated t-tests for administrator's attitude variables for control and experimental groups

	Mean	Std. Dev.	Corr. Coef.	T Value	2-tail Prob.	1-tail Prob.
Control						
ADMENC						
pre	3.88	1.13	0.73	0.77	0.45	0.23
post	4.00	0.91				
Experimental						
ADMENC						
pre	3.72	0.89	0.40	0.18	0.86	0.43
post	3.76	1.09				
Control						
ADMPOS						
pre	3.96	1.14	0.79	0.57	0.57	0.29
post	4.04	0.89				
Experimental						
ADMPOS						
pre	3.65	0.98	0.37	1.43	0.17	0.08
post	3.96	0.83				
Control						
ADMIMP						
pre	4.04	1.06	0.64	-0.94	0.36	0.18
post	3.88	0.93				
Experimental						
ADMIMP						
pre	3.43	1.08	0.69	1.31	0.20	0.10
post	3.65	0.89				

Administration encourages env. ed.--ADMENC
Administration is positive toward env. ed.--ADMPOS
Administration feels env. ed. is important--ADMIMP

Table 22.--Correlated t-tests for teacher's attitude variables for control and experimental groups

	Mean	Std. Dev.	Corr. Coef.	T Value	2-tail Prob.	1-tail Prob.
Control TEANEC						
pre	4.52	0.80	0.69	0.33	0.75	0.37
post	4.56	0.64				
Experimental TEANEC						
pre	4.70	0.47	0.48	-0.70	0.49	0.25
post	4.61	0.66				
Control TEAHEL						
pre	4.78	0.51	0.21	-1.41	0.17	0.09
post	4.59	0.57				
Experimental TEAHEL						
pre	4.72	0.46	0.78	-1.00	0.33	0.16
post	4.64	0.64				
Control TEACON						
pre	3.37	1.42	0.64	1.23	0.23	0.12
post	3.63	0.97				
Experimental TEACON						
pre	3.69	1.26	0.39	1.57	0.13	0.065
post	4.09	0.79				

Feel about teaching env. ed.--necessary/unnecessary--TEANEC
Feel about teaching env. ed.--helpful/harmful--TEAHEL
Feel about teaching env. ed.--confident/unsure--TEACON

the helpful/harmful pairs were negative for all but one case, indicating a drop in means from pre to post. However, the differences were not significant at the 0.05 level. Both the control and the experimental groups had positive t-values for the confident/unsure adjective pair and the 1-tail probability for the experimental group on this variable is 0.065. Thus, although not technically statistically significant, it would seem that the experimental teachers did report more confidence in teaching environmental education in their classrooms on the post-questionnaire.

The third question in the attitude section asked the respondents how they felt about having students work with materials and equipment other than paper and pencil in the classroom. As Table 23 indicates, the means for both groups declined on the first two semantic differential pairs (beneficial/harmful and easy/difficult). This reduction was significant at the 0.04 level for the experimental group on the beneficial/harmful variable. The t-values were positive for both the control and the experimental groups on the important/not important choice, but neither to a significant degree.

The final question concerning attitudes was, "How do you feel about taking your students out-of-doors for lessons?" The three semantic differential pairs were: beneficial/harmful, important/not important, and easy/

Table 23.--Correlated t-tests for teacher's attitudes toward materials other than paper/pencil for control and experimental groups

	Mean	Std. Dev.	Corr. Coef.	T Value	2-tail Prob.	1-tail Prob.
Control MATBEN						
pre	4.96	0.19	-0.06	-0.57	0.57	0.29
post	4.93	0.27				
Experimental MATBEN						
pre	4.80	0.50	0.85	-1.81	0.08	0.04*
post	4.68	0.63				
Control MATEAS						
pre	3.26	1.13	0.34	-0.28	0.78	0.39
post	3.19	1.27				
Experimental MATEAS						
pre	3.78	1.24	0.48	-0.18	0.86	0.43
post	3.74	1.05				
Control MATIMP						
pre	4.67	0.88	-0.03	0.96	0.35	0.17
post	4.85	0.46				
Experimental MATIMP						
pre	4.58	0.65	0.70	0.81	0.43	0.21
post	4.67	0.64				

Feel about students working with materials --
beneficial/harmful--MATBEN
easy/difficult--MATEAS
important/not important--MATIMP

*P $\leq$ 0.05

difficult. From Table 24 it can be seen that the means declined from pre to post in every case but one--the experimental group on the beneficial/harmful choice. However, none of the changes were statistically significant.

Overall, the correlated t-tests showed only one significant difference on the attitude variables and that was a drop in the mean score of the experimental group with regard to the benefits of materials other than paper/pencil. There was an increase in the experimental teachers' confidence with a probability of 0.065, which was relatively close to being significant.

Behavior Variables

The directions preceding this section of the questionnaire on Form A were: PLEASE ANSWER THE FOLLOWING QUESTIONS IN RELATION TO THE PAST SCHOOL YEAR (1977-1978). The Form B directions said: PLEASE ANSWER THE FOLLOWING QUESTIONS IN RELATION TO THIS SCHOOL YEAR (1978-1979) (SINCE SEPTEMBER). Since the post-questionnaires (Form B) were mailed the first of December, 1978, and the majority of them were returned within three weeks, it is necessary to take into account the fact that the report of activities for the pre-questionnaire related to a full year, while those on the post were what took place in a little less than half of a school year.

Table 25 gives the data from the correlated t-tests comparing control and experimental groups on four behavior

Table 24.--Correlated t-tests for teacher's attitudes toward taking their classes out-of-doors for control and experimental groups

	Mean	St. Dev.	Corr. Coef.	T Value	2-tail Prob.	1-tail Prob.
Control OODBEN						
pre	4.81	0.56	0.54	-1.44	0.16	0.08
post	4.67	0.56				
Experimental OODBEN						
pre	4.64	0.64	0.84	0.57	0.57	0.29
post	4.68	0.56				
Control OODIMP						
pre	4.52	0.94	0.59	-1.10	0.28	0.14
post	4.33	1.00				
Experimental OODIMP						
pre	4.48	0.73	0.53	-0.30	0.77	0.39
post	4.43	0.73				
Control OODEAS						
pre	3.12	1.24	0.65	-0.59	0.56	0.28
post	3.00	1.13				
Experimental OODEAS						
pre	3.43	1.08	0.61	-0.44	0.67	0.33
post	3.35	1.07				

Taking students out-of doors --
beneficial/harmful--OODBEN
important/not important--OODIMP
easy/difficult--OODEAS

Table 25.--Correlated t-tests for teacher behavior variables for control and experimental groups

	Range	Mean	Std. Dev.	Corr. Coef.	T Value	2-tail Prob.	1-tail Prob.
Control EELES							
pre	1-5	3.00	1.39	0.48	-3.65	0.001	0.0005*
post		2.04	1.29				
Experimental EELES							
pre	1-5	2.52	1.53	0.47	1.90	0.07	0.035*
post		3.08	1.32				
Control CLOOD							
pre	1-5	1.74	0.98	0.43	-0.37	0.71	0.36
post		1.67	0.96				
Experimental CLOOD							
pre	1-5	1.92	1.00	0.24	1.51	0.14	0.07
post		2.32	1.15				
Control FLDTRP							
pre	1-2	1.29	0.47	0.24	1.28	0.21	0.11
post		1.44	0.51				
Experimental FLDTRP							
pre	1-2	1.36	0.49	0.27	2.01	0.06	0.03*
post		1.60	0.50				
Control CAMP							
pre	1-4	1.15	0.46	0.85	-1.44	0.16	0.08
post		1.07	0.27				
Experimental CAMP							
pre	1-4	1.16	0.62	99.00	-1.28	0.21	0.11
post		1.00	0.0				

Table 25.--Continued

Amount of time spent teaching environmental education lessons--EELES
Number of times classes out-of-doors--CLOOD
Env. Ed. field trips--FLDTRP
Resident outdoor education (camp)--CAMP

*$P \leq 0.05$

variables from the pre and post-questionnaires. The first variable examined was the amount of time the teachers reported that they spent on an ecology or environmental education lesson or unit. Responses were divided into five categories: (1) none, (2) less than 1 week, (3) 1-3 weeks, (4) 4-8 weeks, and (5) more than 8 weeks. The amount of time dropped very significantly for the control group and rose significantly for the experimental group. Assuming that the control teachers were following the same basic schedule during the 1978-79 year as they did for the 1977-78 school calendar, it is to be expected that they would indicate less time on an activity when reporting for half a year than they would have when summarizing a whole year. With the same basic assumption, it is even more striking that the experimental group not only spent more time in the first half of the current school year but significantly more time than in the total previous year on environmental lessons.

The second question in this section asked the respondents to indicate the number of times they had taken their classes out-of-doors for lessons. Responses were again grouped into five categories: (1) none, (2) 1-5, (3) 6-10, (4) 11-15, and (5) more than 15. The control group reported fewer out-of-door activities on the post-questionnaire, but not significantly so. The experimental group indicated that they took their classes out-of-doors

more times in the first half of the 1978-79 year than in all of the previous year. Although the 1-tail probability for this category is 0.07, which is not significant, it should probably be considered as being at least worthy of mention due to the differences in teaching time reported on the pre- and post-forms.

Another behavioral question asked, "Did you take your class on an environmental education-oriented field trip?" Responses were simply coded as no (1) and yes (2). As Table 25 indicates, both control and experimental groups had more people report that they did take field trips on the post-questionnaire, and the experimental group had a significantly greater number do so.

The final variable in this category was whether or not the teacher's class had a resident camping experience. Both control and experimental groups reported less time on this activity on the post-questionnaire, but neither to a significant extent. Again, this is to be expected due to the time discrepancy.

In summary, the respondents were to report behaviors for the entire year previous to the pre-questionnaire, but were only to indicate what they had actually done from September to December of the current year on the post-questionnaire. This factor tends to explain the significant decrease in the amount of time spent by the control group on

environmental lessons or units. However, that same consideration tends to strengthen the significant increases by the experimental group in the amount of time spent on environmental education lessons and the fact that a significantly greater number of them reported taking environmental education-oriented field trips. The difference in teaching time reported on the pre- and post-questionnaires also suggests that the 0.07 level of significance for the increased number of classes out-of-doors by the experimental group might be a conservative figure.

T-test Comparing Principals' and Teachers' Responses to Behavior Variables

The principals' questionnaire (Form C, Appendix C) included a section in which they were to respond to questions concerning the four teacher behavior variables with respect to the individual teachers in their schools involved in the study. In order to perform a t-test comparing group responses on these variables, only the data from the teachers whose principals answered with respect to them specifically were used. This was a total of 32 teachers from both the control and the experimental groups.

In examining the data in Table 26, the only variable for which the variance between the teachers and the principals' groups was significantly different was that of the frequency with which "hands-on" activities were used in

the classroom. However, the means were not significantly different for any of the four behavior variables. This would seem to indicate that there was some validity to what the teachers reported on these variables.

Table 26.--T-test for teachers and principals concerning four teacher behavior variables

	Range	Mean	Std. Dev.	F Value	2-tail Prob.	Pooled Variance Est. T Value	2-tail Prob.	1-tail Prob.
EELES	1-5							
Teachers		2.69	1.38	1.15	0.70	0.47	0.64	0.32
Prin.		2.52	1.48					
CLOOD	1-5							
Teachers		1.97	1.09	1.77	0.12	0.65	0.52	0.26
Prin.		1.81	0.82					
FLDTRP	1-2							
Teachers		1.53	0.51	1.03	0.93	0.99	0.32	0.16
Prin.		1.41	0.50					
HANDSON	1-5							
Teachers		4.25	1.08	2.29	0.02	0.68	0.50	0.25*
Prin.		4.41	0.71					

Amount of time spent teaching env. ed. lessons--EELES
Number of times classes out-of-doors--CLOOD
Env. Ed. oriented field trip--FLDTRP
Frequency of "hands-on" activities in classroom--HANDSON

*Separate variance estimate rather than pooled variance estimate.

Teachers' Use of Concepts

Correlated t-tests were calculated for the pre- and post-responses of both control and experimental groups on each of the nine concepts listed in the questionnaires (see Table 27). The directions were: FROM THE FOLLOWING LIST OF CONCEPTS, PLEASE INDICATE WITH A CHECK ANY THAT APPROXIMATE THE CONCEPTS YOUR STUDENTS WERE TO LEARN FROM SPECIFIC LESSONS OR UNITS (YOU TAUGHT THIS PAST YEAR--Form A) (YOU HAVE TAUGHT THIS YEAR--Form B). Again, the post-questionnaires should reveal only concepts used from September to December, 1978, while the pre-questionnaires should deal with the entire 1977-78 school year.

Table 27 contains the results of those t-test calculations. Only two categories show a significant difference between the pre- and post-responses--the experimental group for concept 1 and the experimental group for concept 8. Number 1 is, "Living things are interrelated with one another and their environment," and number 8 is, "Organisms and environments are in constant change." Since these two concepts seemed to be emphasized more than some of the others at the workshops (see Table 3), it is logical to assume that the participants would tend to also carry that over to their classrooms.

Because the teachers were reporting only what they had used in the first half of the 1978-79 school year, any

Table 27.--Correlated t-tests for teachers' use of concepts for control and experimental groups

	Mean	Std. Dev.	Corr. Coef.	T Value	2-tail Prob.	1-tail Prob.
Control CONCEPT 1						
pre	0.81	0.40	0.66	-0.57	0.57	0.29
post	0.78	0.42				
Experimental CONCEPT 1						
pre	0.72	0.46	0.70	1.81	0.08	0.04*
post	0.84	0.37				
Control CONCEPT 2						
pre	0.44	0.51	0.55	0.0	1.00	0.50
post	0.44	0.51				
Experimental CONCEPT 2						
pre	0.56	0.51	0.60	1.36	0.19	0.09
post	0.68	0.48				
Control CONCEPT 3						
pre	0.33	0.48	0.43	0.37	0.71	0.36
post	0.37	0.49				
Experimental CONCEPT 3						
pre	0.40	0.50	0.40	-1.14	0.27	0.13
post	0.28	0.46				
Control CONCEPT 4						
pre	0.41	0.50	0.41	0.70	0.49	0.25
post	0.48	0.51				
Experimental CONCEPT 4						
pre	0.28	0.46	0.69	-0.57	0.57	0.29
post	0.24	0.44				

Table 27.--Continued

	Mean	Std. Dev.	Corr. Coef.	Value	2-tail Prob.	1-tail Prob.
Control CONCEPT 5						
pre	0.33	0.48	0.21	1.55	0.13	0.07
post	0.52	0.51				
Experimental CONCEPT 5						
pre	0.36	0.49	0.48	0.0	1.00	0.50
post	0.36	0.49				
Control CONCEPT 6						
pre	0.56	0.51	0.33	-0.33	0.75	0.37
post	0.52	0.51				
Experimental CONCEPT 6						
pre	0.44	0.51	0.35	0.0	1.00	0.50
post	0.44	0.51				
Control CONCEPT 7						
pre	0.07	0.27	0.28	1.00	0.33	0.16
post	0.15	0.36				
Experimental CONCEPT 7						
pre	0.12	0.33	0.51	0.57	0.57	0.29
post	0.16	0.37				
Control CONCEPT 8						
pre	0.56	0.51	0.55	0.0	1.00	0.50
post	0.56	0.51				
Experimental CONCEPT 8						
pre	0.44	0.51	0.12	2.55	0.02	0.009*
post	0.76	0.44				

Table 27.--Continued

	Mean	Std. Dev.	Corr. Coef.	T Value	2-tail Prob.	1-tail Prob.
Control						
CONCEPT 9						
pre	0.26	0.45	0.42	0.0	1.00	0.50
post	0.26	0.45				
Experimental						
CONCEPT 9						
pre	0.24	0.44	0.82	1.44	0.16	0.08
post	0.32	0.48				

*P ≤ 0.05

positive shift from pre to post is possibly a conservative figure of what would result if the questionnaires had been mailed in May. Therefore, it is necessary to look at the probabilities between the 0.05 and 0.10 α levels as ones that might be significant under different circumstances. Three values fall into that category: experimental group--concept 2 (0.09), control group--concept 5 (0.07), and experimental group--concept 9 (0.08). Again, for the experimental group the concepts in the "bio-physical" and in the "change" categories (see Table 4), which received more attention at the majority of the workshops, were also the ones to be used somewhat more often in the classroom.

Summary

Correlated t-tests were computed comparing pre- and post- responses to individual variables for both the control and the experimental groups.

The one significant change in the attitude variables was a negative shift by the experimental group concerning the benefits of materials other than paper and pencil in the classroom. There was an increase that was relatively close to statistical significance for the experimental groups in the amount of confidence they reported in teaching environmental education.

The control group had a significant decrease in the amount of time spent on environmental lessons or units. This

was to be expected since the post-questionnaire reported activities for less than half of the current school year, while the pre-questionnaire dealt with an entire nine months. Even with this constraint, the experimental teachers indicated a significant increase on the post-questionnaire in the amount of time spent on environmental education lessons and in the number of environmental-oriented field trips.

A t-test comparing responses of the principals with respect to the activities of teachers in their schools involved in the study, seemed to support what the teachers reported they were doing for four behavior variables.

Correlated t-tests were also used to establish the fact that the experimental group used two of the concepts more often in the post-questionnaire time frame than they did on the pre-questionnaire.

Pearson Correlations

Background Variables vs. Behaviors

Table 28 gives the correlation coefficients and the significance levels comparing three background variables (amount of environmental education workshops, grade taught, and years teaching) with the amount of time spent on environmental education in the classroom. As previously mentioned, the amount of time spent on environmental education lessons reported for the post data was for less

Table 28.--Pearson Correlations between amount of time spent teaching environmental education and three background variables--for experimental, control, and groups combined, for both pre- and post-questionnaires

	EEWS	
	EELES - pre	EELES - post
Experiment	0.10 S=0.31	0.38 S=0.03*
Control	0.35 S=0.03*	0.12 S=0.28
Combined	0.22 S=0.047	0.39 S=0.002*
	GRDTGHT	
Experiment	0.09 S=0.32	0.39 S=0.03*
Control	0.33 S=0.037*	-0.19 S=0.17
Combined	-0.04 S=0.37	0.03 S=0.42
	YRSTCH	
Experiment	-0.45 S=0.007*	-0.25 S=0.11
Control	0.07 S=0.35	-0.12 S=0.27
Combined	-0.24 S=0.035*	-0.07 S=0.32

Environmental Education Workshops or Courses--EEWS; Amount of time spent teaching environmental lesson or unit--EELES; Grade taught--GRDTGHT; Years teaching--YRSTCH.
(First number is correlation coefficient and second is significance level).

*$P \leq 0.05$

than half of the current school year and, theoretically, would be less than if the same question were asked at the end of the year. Data are given from both the pre- and the post-questionnaires, for the experimental and control groups separately and for the two groups combined.

The first section of Table 28 compares the amount of time the teachers have been exposed to environmental education workshops or courses with the amount of time they devote to environmental education lessons or units in their classrooms. On the pre-questionnaire only the control group showed a significant positive correlation on these variables. However, on the post-questionnaire, the experimental group (after their previous summer's workshop or course) had a positive correlation, as did the groups combined.

The second set of correlations involves the grade taught and the amount of time spent on environmental education lessons. For the pre-questionnaire, the control group showed a significant negative correlation on the variables, and on the post-questionnaire, the experimental group received a significant positive correlation. As discussed earlier (see Table 11 and p.64) the control group has a higher mean for "grade taught" than does the experimental group. Therefore, a negative correlation for a group composed of more upper level teachers and a positive correlation for a group of teachers in the lower grades would

seem to indicate that the peak activity for environmental education lessons is probably in the middle grades.

The last section of Table 28 shows the correlations between the number of years of teaching experience and the amount of time spent on environmental lessons. For five of the six coefficients there was a negative correlation, and it was significant on the pre-questionnaire for the experimental group alone and for the groups combined. Thus, less experienced teachers seemed to spend more time on environmental lessons than those who have been teaching longer.

Table 29 reports the correlations between the amount of time the teachers had spent in environmental education workshops and the number of times they took their classes out-of-doors. There is a significant positive correlation between these variables for the groups combined on the post-questionnaire.

Thus, it appears that for the group of teachers as a whole, there was a positive correlation between the amount of time they had been involved with environmental education workshops or courses and: (1) the number of times they took their classes out-of-doors, and (2) the amount of time they spent on environmental education lessons in their classrooms. The middle grades are probably the level at which more time is spent on environmental education than

either the upper or the lower grades. There was also some indication that less experienced teachers spent more time on environmental education lessons than those who had been teaching longer.

Table 29.--Pearson Correlation between amount of time teachers have spent in environmental education workshops and the number of times they took their classes out-of-doors--for experimental, control, and groups combined, for both pre- and post-questionnaires

	EEWS CLOOD - pre	CLOOD - post
Experimental	0.09 S=0.31	0.11 S=0.31
Control	-0.03 S=0.43	-0.03 S=0.45
Combined	0.03 S=0.41	0.23 S=0.05*

Environmental Education Workshops or Courses--EEWS
Classes out-of-doors--CLOOD

(First number is correlation coefficient and second is significance level).

*$P \leq 0.05$

Attitude Variables vs. Behaviors

Pearson correlations were also calculated to compare groups of attitude variables with closely associated behaviors. A correlation coefficient and significance level are reported for each attitude variable from the pre- and post-questionnaires for the experimental group, the control group, and the two combined.

The question, "How do you feel about teaching environmental education in your classroom?", had three paired adjectives along a five-point semantic differential scale: necessary/unnecessary, helpful/harmful, and confident/unsure, with the positive responses coded as five. Table 30 contains the data from the Pearson correlations for each of these variables compared with the amount of time spent in teaching environmental education lessons. Five of the six calculations for the necessary/unnecessary variable indicated significant positive correlation between the more positive attitude and the greater amount of time on lessons. In the helpful/harmful category one slightly but not significantly negative correlation existed. Four-fifths of the remaining figures showed significant positive correlations between the attitude and the behavior. The confident/unsure variable resulted in less definitive correlations. One was again slightly negative, but not to a significant degree. Only two of the remaining five showed significant positive correlations between feeling confident about environmental education and spending more time on it in the classroom.

The next question was, "How do you feel about students working with materials and equipment other than paper and pencil in the classroom?"--beneficial/harmful, difficult/easy, and important/not important. Again, positive responses were assigned a value of five on the semantic

Table 30.--Correlations between variables concerning attitudes about environmental education in class and the amount of time spent on environmental education lessons--for experimental, control and groups combined for both pre- and post-questionnaires

	EELES					
	TEANEC-pre	TEANEC-post	TEAHEL-pre	TEAHEL-post	TEACON-pre	TEACON-post
Experimental	0.03 S=0.45	0.37 S=0.037*	-0.14 S=0.23	0.33 S=0.05*	0.23 S=0.11	-0.05 S=0.42
Control	0.45 S=0.007*	0.44 S=0.01*	0.34 S=0.03*	0.44 S=0.01*	0.68 S=0.001*	0.26 S=0.10
Combined	0.25 S=0.028*	0.40 S=0.002*	0.06 S=0.31	0.37 S=0.003*	0.43 S=0.001*	0.21 S=0.07

Teaching environmental education in the classroom--
necessary/unnecessary--TEANEC
helpful/harmful--TEAHEL
confident/unsure--TEACON
Amount of time spent teaching environmental education lessons or units--EELES

(First number is correlation coefficient, second is significance level).

*P $\leq$ 0.05

differential five-point scale. Each of these variables was correlated with the amount of time the teachers reported using "hands-on" activities in their classrooms. As Table 31 indicates, the correlation coefficients in every category were positive. Four of the six coefficients for each variable were significant, with the groups combined receiving better than 0.05 level for both pre- and post-questionnaires on all three variables.

The final attitude question examined was, "How do you feel about taking your students out-of-doors for lessons?"--beneficial/harmful, important/not important, and easy/difficult. These were each correlated with the number of times classes were actually taken out-of-doors. In every case (Table 32) the correlation coefficients were positive. Two-thirds of them in both the beneficial/harmful and the important/not important categories were significant. The control group and the groups combined on the post-questionnaire had significant correlations on the easy/difficult variable. The groups combined showed a significant correlation between positive attitudes toward taking classes out-of-doors and actually doing so in all but one situation.

Summary

Since the comparison of attitudes and behaviors theoretically should not be affected by whether a respondent

Table 31.--Pearson Correlations between variables concerning attitudes and behaviors for "hands-on" activities for experimental, control and groups combined for both pre- and post-questionnaires

	HANDSON					
	MATBEN-pre	MATBEN-post	MATEAS-pre	MATEAS-post	MATIMP-pre	MATIMP-post
Experimental	0.25 S=0.09	0.65 S=0.001*	0.32 S=0.045	0.33 S=0.05*	0.45 S=0.007*	0.65 S=0.001*
Control	0.52 S=0.002*	0.26 S=0.09	0.18 S=0.18	0.31 S=0.06	0.18 S=0.17	0.31 S=0.06
Combined	0.30 S=0.009*	0.37 S=0.004*	0.25 S=0.03*	0.34 S=0.008*	0.29 S=0.01*	0.41 S=0.001*

Students working with materials other than paper and pencil--
beneficial/harmful--MATBEN
easy/difficult--MATEAS
important/not important--MATIMP
How often "hands-on" activities used in classroom--HANDSON

(First number is correlation coefficient, second is significance level).

*P $\leq$ 0.05

Table 32.--Pearson Correlation between variables concerning attitudes and behaviors for classes in the out-of-doors--for experimental, control and groups combined for both pre- and post-questionnaires

	CLOOD					
	OODBEN-pre	OODBEN-post	OODIMP-pre	OODIMP-post	OODEAS-pre	OODEAS-post
Experimental	0.40 S=0.015*	0.36 S=0.04*	0.46 S=0.006	0.10 S=0.32	0.07 S=0.36	0.18 S=0.20
Control	0.25 S=0.09	0.22 S=0.14	0.31 S=0.05*	0.32 S=0.05*	0.30 S=0.06	0.33 S=0.05*
Combined	0.31 S=0.009*	0.28 S=0.02*	0.36 S=0.002*	0.23 S=0.05*	0.16 S=0.11	0.28 S=0.02*

Lessons in the out-of-doors--
beneficial/harmful--OODBEN
important/not important--OODIMP
easy/difficult--OODEAS
Number of times classes out-of-doors--CLOOD

(First number is correlation coefficient, second is significance level).

*P $\leq$ 0.05

121A

121B

was in the control or the experimental group, Pearson correlations were computed not only on the groups separately but also combined. There seemed to be a high degree of correlation between feeling that environmental education is both necessary and helpful and in spending a greater amount of time on environmental education lessons in the classroom. There was some indication that more time on environmental education lessons and more confidence in teaching it were positively correlated. The experimental group tended to show significant correlations more often than the control, but the combined calculations in every case seemed to say that the more beneficial, easy, and important teachers felt "hands-on" experiences were, the more they used them in their classrooms. Finally, it would appear that the ease of taking classes out-of-doors might have influenced the number of times a teacher did so, but the degree of beneficiality and importance associated with use of the out-of-doors seemed to be a stronger indication of how often that activity took place.

CHAPTER V

SUMMARY, CONCLUSIONS AND IMPLICATIONS, AND RECOMMENDATIONS

Summary of Design

This study was undertaken in an attempt to examine four in-service environmental education programs to: (1) assess their content with respect to stated activities and objectives; (2) determine whether or not the experiences correlated with changes in environmental education attitudes and selected teaching behaviors; and (3) suggest a workable evaluative model for such programs.

The design of the research included observation, descriptive survey, and ex post facto methods. The first two techniques were used to assess the content of the respective in-service programs using an observer with checklists and a post-study questionnaire completed by participants. The ex post facto design involved the in-service participants as the experimental group and two separate groups of teachers as comparison groups. All subjects completed a pre-questionnaire giving background information about themselves and responding to questions concerning: (1) their attitudes about various aspects of environmental

education and (2) selected activities and teaching behaviors. A post-questionnaire was mailed to all respondents in December of the following school year asking the same questions as before. Principals of all teachers participating in the study were also sent a questionnaire concerning their own attitudes toward environmental education and various activities associated with it, and asking them to respond to questions about selected teaching behaviors of their teachers who were involved in the research. (See Table 33 for a summary of statistical procedures.)

Conclusions and Implications

Workshop Objectives

The activities stated by the leaders of the Cleveland and the Toledo workshops were:

PHASE I

1. Define environmental education and its philosophies and techniques.
2. Integrate environmental education with existing subjects.
3. Explore the resources of the workshop site.
4. Prepare an initial program of instruction.

PHASE II

5. Use the initial program with elementary children involved in the workshops.
6. Evaluate and discuss these programs or lesson plans.

Table 33.--Summary of problems, methods or statistical procedures and results

Problem	Methods or Statistical Procedures	Results
I) Assess content of in-service w/respect to stated objectives	Checklists (E. F, G) Form D	
A. Dayton		Yes
B. Columbus		Yes
C. Cleveland		Yes
D. Toledo		Partially
II) Changes in attitudes toward various aspects of EE and changes in selected teaching behaviors		
A. Attitudes		
1. group comparisons (prin. vs. teachers)	ANOVA	significant differences on 2 variables out of 9
2. pre - post	Correlated t-tests	exp. group declined on 1 variable of 12
B. Behaviors		
1. group comp. (prin. vs. teachers)	t-test	no differences on any of 4 variables
2. pre - post	Correlated t-tests	exp. group increased on 2 variables of 5
3. concept use pre - post	Correlated t-tests	exp. group increased use of 2 concepts out of 9

Table 33.--Continued

Problem	Methods or Statistical Procedures	Results
C. Background vs. Behaviors	Pearson Correlation	Relatively strong corr. on 1 out of 4 comparisons
D. Attitude vs. Behavior	Pearson Correlation	Strong corr. on all 3 pairs of variables

7. Prepare instructional materials for use in the workshops.

8. Discuss means for adapting instructional plans for use in the classroom, with the discussion supplemented by outside resource people.

PHASE III

9. Develop an environmental studies unit for an individual classroom.

10. Obtain feedback from peers concerning this proposal or unit.

11. Implement the unit in the classroom.

12. Evaluate the unit as it was conducted through discussion with peers from the workshop.

The specific objectives to be achieved from these activities were for the teachers to be able to:

CT1) make greater use of "hands-on" experiences in the classroom

CT2) develop an environmental studies unit or lessons for use in their own classroom

CT3) make use of natural materials and resources in their classroom

CT4) share ideas, activities, and suggestions with their peers, both at the workshop and in their home schools.

The objectives of the Dayton leaders were:

D1) to make teachers feel good about the world around them and to develop positive attitudes towards wild plants and animals

D2) to become more perceptive and sensitive to the "real world"

D3) to help teachers feel more confident with environmental education

D4) to encourage teachers to use the outdoors more often

D5) to help teachers find ways to incorporate facets of the environment into the ongoing curriculum.

The objectives of the Columbus course were:

C1) to develop understanding of the concepts of environmental management education, conservation education, outdoor education, and natural history

C2) to develop within teachers the self-confidence and skill to work with their students in each of the aforementioned areas--particularly in out-of-doors settings

C3) to help teachers develop, design, and implement an extensive environmental education curriculum plan to be used by other teachers, as well as themselves, in their respective teaching situations.

Workshop Activities

From the observer's checklists and the post-study questionnaire completed by the in-service participants, there seemed to be some emphasis placed on defining environmental education, which was an activity or objective named by all but the Dayton leaders. The generalized definition of environmental education given by the control and experimental teachers' groups and by their principals was "education about the human environment." There did not seem to be a substantive difference in the definition given by the participants and the non-participants, nor was there an obvious change from the pre- to the post-questionnaire.

The second activity listed for Cleveland and Toledo and suggested in the objectives for Dayton was to learn to

integrate environmental education with existing subjects. The observer's checklists and the teachers themselves indicated that the Cleveland program accomplished this task very well and the others to a moderate degree. The pre- and post-questionnaires revealed that the overwhelming majority of educators believe that environmental education should be incorporated into all subject areas, with no substantial difference of opinion between control and experimental groups or from pre- to post-study. However, expressing an idea and having the practical knowledge to carry it out are not necessarily synonymous, and it seems that the Cleveland participants felt they had actually learned how to integrate environmental education with existing subjects.

Exploring the resources of the workshop site was a specifically stated activity for Cleveland and Toledo and was one of the means for achieving objectives 1 and 2 in Dayton. Cleveland and Dayton teachers both indicated that there was strong emphasis in this area, while the Toledo participants felt it received only moderate emphasis.

Activities 4, 6, 7, 8, 9, and objectives CT2, CT4, D5, and C3 (pp. 114 and 115) refer to preparing, discussing, and evaluating environmental education lessons or units. The participants' assessment of these activities indicate that the Columbus and Cleveland programs placed a great deal

of emphasis on them, while those in Dayton and Toledo did so only a moderate amount. The Columbus and Cleveland teachers were also fairly strong in their feelings about how strong, useful, and pleased they were with the materials they developed.

Questions pertaining to what they would prefer to have emphasized at environmental education workshops and what kind of assistance would be most valuable at school were asked of the control, experimental, and principals' groups. They all seemed to agree that "teaching methods" and "resource materials" were of primary importance. The experimental group was not asked specifically if these activities took place in their respective programs, but the checklist and interviews with participants indicate that "hands-on" techniques and resource materials were both emphasized in Cleveland and the former was in Dayton.

The main activity in PHASE II for the Cleveland and Toledo teachers was to use their initial program of instruction with elementary children involved in the workshops. Their final evaluation of that experience was moderate satisfaction with how beneficial, necessary, and encouraging it was.

Developing an understanding of concepts was a stated objective for only the Columbus course. Due to a problem with the instrument in this area, it is not possible to

determine whether there was an actual change in understanding for any of the nine identified concepts. However, according to the checklists, there was both direct and indirect discussion of them to a fairly strong degree in Columbus and Dayton, and to a moderate degree in Cleveland. Dayton activities tended to emphasize the "bio-physical" and the "change" categories, while the other two had a more even distribution throughout the four areas. The materials or plans developed by the Columbus teachers included the concepts to a much greater extent than any of the others. Correlated t-tests comparing pre-post changes in what the teachers reported on their use of the concepts in the classroom were calculated. A significantly greater number of the experimental teachers reported an increase in the use of concepts in the "bio-physical" and the "change" categories, while the control group showed no change from pre- to post-study.

Attitudes

It has been established that behavior is part of a three-fold construct of attitudes which also involve the feeling a person has about the object or idea. It is also known that the activities a teacher conducts in the classroom often are regulated to an extent by the physical setting and the administration of the school. Two of the objectives listed by the in-service leaders (D3 and C2)

specifically relate to the feeling of confidence within teachers about teaching environmental education. Since the stated behavioral objectives could also be affected by their attitudes, the pre-, post-, and principals' forms of the questionnaire all contained sections about those.

The teachers seemed to feel that their administrators give less encouragement and importance to environmental education than the principals themselves report they do. Although the literature indicates that teachers themselves are primarily responsible for the activities that take place in their classrooms, it is possible that this discrepancy in interpretation of the attitude of the administration could have influenced both what the teachers felt comfortable and encouraged in doing.

Correlated t-tests indicated no significant change from pre- to post-study for either control or experimental groups concerning their administrator's attitudes. Thus, it would seem that there was not necessarily more communication between the teachers and the administrators following an in-service experience.

The attitudes of the teachers as to whether environmental education is necessary or helpful also showed no significant change from pre- to post-study. However, the experimental group did show a positive shift at the 0.065 α level toward a greater amount of confidence in teaching

environmental education. This indicates that there was at least a tendency toward correlation between attendance at a workshop and greater confidence, which supports the achievement of objectives D3 and C2 for the Dayton and Columbus programs.

Several of the objectives for the program dealt with using natural materials or "hands-on" experiences in the classroom and using the out-of-doors for lessons. Attitude variables concerning the beneficiality, ease, and importance of materials other than paper and pencil or use of the out-of-doors correspond to those goals. The only significant change between pre- and post-study for any of those variables was a negative shift for the experimental group on the beneficiality of materials other than paper/pencil. There did not seem to be a reasonable explanation for this change in attitude, but it did not appear to be accompanied by using "hands-on" activities less frequently in the classroom.

Behaviors

Since a number of activities and objectives for the workshops (I1, CT1, CT3, D4, C2, and C3 on pp. 114-115) refer to changes in specific teaching behaviors, t-tests and Pearson correlations were calculated to see if there were changes on those variables that could be correlated with attendance at the in-service programs. Due to time

constraints within the design of the study, behaviors reported by the teachers for the pre-questionnaire covered an entire school year, while those on the post-questionnaire were for less than half a year. They were asked to report only activities they had actually conducted to control the fact that "good intentions" in a teaching situation do not always lead to actual practice. Therefore, any increase in the amount of time or number of activities indicated on the post-questionnaire were interpreted to be somewhat conservative but not necessarily exactly half of that which might be found on a survey taken at the end of the current school year.

There was a significant drop in the amount of time the control teachers spent on environmental education lessons or units during the time frame for the post-questionnaire. This was not unexpected due to the constraint discussed above. However, in the same situation, the experimental group reported a significant increase in the time spent on environmental education. A significantly greater number of experimental teachers also reported taking their classes on environmentally-oriented field trips. There was an increase by the experimental subjects at the 0.07 α level in the number of times they took their classes out-of-doors, which was again assumed to be a conservative estimate because of the reported time difference from pre-

to post-study. The teachers' own accounts of these activities were supported by the reports of their principals on the same variables. Thus, it would appear that attendance at one of the workshops correlated positively with more environmental education lessons, more field trips, and possibly with greater use of the out-of-doors.

Pearson product-moment correlations seemed to confirm the fact that the more teachers had been exposed to environmental education in-service programs, the more time they spent on environmental education lessons in their classrooms. There was also some, but less substantial, indication that amount of experience with workshops correlated positively with the number of times teachers took their classes out-of-doors. There was also data to suggest that the amount of time spent on environmental education correlated with "grade taught" and with "years of teaching experience." The middle grades and younger teachers tended to give it more emphasis.

Each set of attitude variables was correlated with its respective behavioral variable to see if any significant relationships existed. Teachers' feelings about environmental education were compared with the amount of time they spent on environmental education lessons or units. Attitudes concerning the use of materials and equipment other than paper and pencil in the classroom were correlated with their

frequency of using "hands-on" activities. Finally, feelings about taking their classes out-of-doors were correlated with the number of times they reported doing so. In all three cases there appeared to be strong positive correlations between the variables.

Thus, there is reason to believe that the objectives of the in-service programs relative to helping the participants implement environmental education lessons or units in the classroom, and encouraging them to use the out-of-doors more often were achieved.

In summation, the findings of the descriptive survey portion of the study were as follows:

1. Some emphasis was placed on defining environmental education in all four in-service programs

2. The Cleveland program appeared to be the most successful in helping the participants learn to integrate environmental education with existing subjects

3. The Cleveland and Dayton programs both included strong emphasis on exploring the resources of the workshop site

4. The participants indicated that the Columbus and Cleveland programs placed a great deal of emphasis on preparing, discussing and evaluating environmental education lessons or units

5. Teachers and principals seemed to agree that "teaching methods" and "resource materials" were the primary choices for inclusion in an environmental education workshop and for assistance at school

6. Participants reported moderate satisfaction with the programs of instruction they developed during the in-service programs

7. There was also moderate satisfaction with the participation of elementary children in the workshops by the teachers in the two groups for which that was a factor.

The results of the ex post facto part of the research were:

1. The teachers seemed to feel that their administrators give less encouragement and importance to environmental education than the principals themselves reported

2. The only significant change from pre- to post-questionnaire in attitude variables was a negative shift on the part of the experimental group for the degree of benefit they feel is derived from materials and equipment other than paper and pencil

3. On the variable concerning the amount of time spent teaching environmental education lessons in their classrooms, the control group showed a significant drop on the post-questionnaire, while the experimental group reported a significant increase

4. Of the nine concepts examined, two were included in the curriculum by a significantly greater number of experimental group teachers during the post-questionnaire time frame

5. A significantly greater number of experimental teachers reported taking their classes on environmentally-oriented field trips during the post-questionnaire period

6. It seemed that the more the research participants had been exposed to environmental education in-service, the more time they spent on environmental lessons in their classrooms

7. There is some indication that the amount of time spent on environmental education correlated with "grade taught" and "years of teaching experience" with the middle grades and younger teachers in the study giving it more emphasis

8. Strong positive correlations were found between each of three pairs of attitudes and behaviors:
   a. feelings about environmental education and the amount of time spent on environmental education lessons or units
   b. attitudes concerning the use of materials and equipment other than paper/pencil and the frequency of using "hands-on" activities
   c. feelings about taking classes out-of-doors and the number of times reported doing so.

Recommendations

One of the intentions of this study was to suggest an evaluative model for environmental education teacher in-service programs. The basic design seemed to lend itself to identifying differences between groups and changes over time. If time permits it would probably be better to distribute the post-questionnaires at the end of the school year following the in-service or at a time that would equalize the period for which the teachers are to report activities pre and post. Such a procedure would make interpretation of the results easier and more compatible.

Any instruments used by another researcher must be developed in accordance with the activities and objectives of the program examined in order to operationalize the model in a different situation than those in this study. The semantic differential scale appears to be a reliable method of assessing attitudes or feelings about various aspects of a program or teaching techniques. Open-ended questions are

adequate for behavioral-type questions but are time-consuming for the subject to complete and for the researcher to code. Care must be taken to keep the instrument to a reasonable length to insure a higher return. Participants seem less inclined to participate in a study that requires the involvement of fellow teachers, students, and principals than if they can simply spend a few minutes of their own time completing a checklist. In this case, the solicitation of responses from fellow teachers and principals was felt to be essential. However, the length and nature of the original questionnaire and an early intention to ask questions of the participants' students is believed to have discouraged and threatened some people who did not choose to participate as a result.

Another generalized study of a number of in-service experiences should be conducted to assess changes by the participants in environmental concepts. Further study could also confirm or negate the idea that amount of exposure to environmental education workshops correlates with greater use of the out-of-doors for lessons and increased confidence in teaching environmental education. Such a study should also attempt a more rigorous definition of those variables in order to make more definitive comparisons.

APPENDIX A

Descriptions and Daily Activity Outlines for Each Workshop

Aullwood Audubon Center
Aullwood Road, Vandalia, Ohio

June 19-30, 1976

The June 19-30 Aullwood Audubon Center workshop was held in conjunction with Wright State University and was offered for 3 hours of graduate credit. The participants met every day for two weeks from 8:30 a.m. until 1:00 p.m. Dr. Robert Earl was the university professor associated with the course. Paul Knoop, director of Aullwood Audubon Center, was responsible for daily activities. Other members of the Farm and Center staffs assisted on a regular basis with various activities and group hikes. There were also several outside resource people who presented individual topics, such as soil, geology, and population, for one session only.

AULLWOOD AUDUBON CENTER
JUNE 19-30, 1978

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Weather 8:30 Introduction Information Grading Exploration of Aullwood 11:00 Lunch 12:30 Schedules, Options	Weather 8:30 Sensory Activity 10:00 Discovery Walk 11:00 Lunch 11:30 Options 12:40 Sharing	Weather 8:30 Soil-Dick Watkins 11:00 Lunch 11:30 New Games 12;40 Sharing	Weather 8:30 Geology- Dave Mooter 11:00 Lunch at river 11:30 Exploration for fossils	Weather 8:30 Plants 11:00 Lunch 11:30 Options 12:40 Sharing
MONDAY	**TUESDAY**	**WEDNESDAY**	**THURSDAY**	**FRIDAY**
Weather 8:30 Insects & Aquatic Study 11:00 Lunch 11:30 Options 12:40 Sharing	Weather 8:30 Birds & Mammals 11:00 Lunch 11:30 Options 12:40 Sharing	Weather OVERNIGHT Supper 6:00 7:30 Man & Nature Discussion 9:30 Astronomy or Hike 11:00 Overnight	Weather 7:00 Bird Walk 8:30 Population 11:00 Lunch 11:30 New Games 12;40 Sharing	Weather 8:30 School Site 11:00 Lunch 11:30 Evalua- tion

OHIO STATE UNIVERSITY — Summer 1978/First Term
NATURAL RESOURCES 611 — MTWRF/9:00 a.m.-12:00
FIELD COURSE AND WORKSHOP IN ENVIRONMENTAL EDUCATION — 164 Howlett Hall

INSTRUCTOR: Dr. Mary Lynne Bowman 422-5589 Office

Mon. June 19	Introduction:	Goals and Objectives Orientation Evolution of Environmental Ed. Curriculum Plan - Guest Lecturer: Teresa Myer
Tues. June 20	Perception "What You Are Is Where You Were When"	
Wed. June 21	Values Clarification Strategies	
Thurs. June 22	Cultural Ecology Guest Lecturer: Dr. Chung-min Chen, Assistant Prof., Anthropology	
Fri. June 23	How To Use The ERIC System Class Meets at ERIC/SMEAC, 1200 Chambers Rd.	
Mon. June 26	Simulations	
Tues. June 27	Tree Identification Guest Lecturer: William F. Cowen, Jr., Prof. Class will meet at University Woodlot Forestry	
Wed. June 28	Ecological Concepts	
Thurs. June 29	Pond Ecology Guest Lecturer: Dr. Robert Roth, Chm. Div. Env. Ed. Class will meet at Farm Science Review Conservation Area, 3400 Case Rd.	

Fri.
June 30 Terrestrial Ecology/ Land Use Management
Field Trip to Barnebey Center

Mon.
July 3 No class

Tues.
July 4 No class

Wed.
July 5 Population
Guest Lecturer: Dr. Carl S. Johnson, Prof. Env.Ed.

Thurs.
July 6 Energy
Guest Lecturer: Dr. Herbert L. Coon,Prof. Sci.Ed.

Fri.
July 7 Work on Projects

Mon.
July 10 Water Quality
Robert Townsend, PH.D. Candidate, Env. Ed.

Tues.
July 11 Water Management
Guest Lecturer: Dr. John Disinger, Assoc. Prof.
Env. Ed.

Wed.
July 12 Air Pollution
Robert Townsend

Thurs.
July 13 Land Lab Development
Class will meet at Westerville North High School

Fri.
July 14 Work on Projects

Mon.
July 17 Work on Projects

Tues.
July 18- Project Presentations
19 Written Portion Due at time of Presentation

N.R. 611 Summer 1978/First Term

I. Course Objectives:
The purpose of this course is to:

(1) provide teachers with background information on a variety of environmental education topics including:
- perception
- values/attitudes
- cultural ecology
- basic ecological concepts
- land use management
- population
- energy
- water quality
- air pollution

(2) identify local environmental education resources available to teachers

(3) assist in the development of an extensive environmental curriculum plan appropriate for each teacher particular set of learners

(4) explore the potential of various teaching methodologies and strategies appropriate for facilitating environmental education in the classroom.

II. Student Tasks:
Students will be expected to:

(1) attend class

(2) participate in class activities and discussions

(3) develop and submit in writing an environmental education curriculum plan appropriate for use by other teachers, as well as themselves, in their respective teaching situations. This plan shall include:

A) Statement of philosophy
B) Rationale
C) General and specific objectives
D) Specific targeted audience
E) Time Frame
F) Teaching activities

G) Materials needed
H) Evaluation techniques
I) Bibliography

(4) Share by way of a brief presentation, the individual curriculum plans with others in the class.

III. Grading

Grading will be based on attendance/ participation in class and the quality of the individual curriculum plan.

environmental experiences workshop for elementary teachers

at
Shaker Lakes Regional Nature Center

June 28 - July 27, 1978 9:00 a.m. - 2:00 p.m. • EDW 511, Section 31, 5 Graduate Credits

The Program:

Environmentalists in recent decades have sensitized a large portion of our population to the need for individual and societal consciousness of man's role in the ecosystem. The education process in schools provides the means by which our society can be prepared to make appropriate environmental decisions. Young children make up one of the most receptive components with which to begin this educative process.

Goals of this 18-day workshop are:

1. to build a sense of relationship—in both feelings and understandings—between the participants and the natural world;
2. to develop environmental themes as a means of integrating various subject matters into a meaningful, unified program;
3. to provide a practicum experience where participants can try out activities with children;
4. to provide the opportunity for participants to plan and implement a classroom unit based on an environmental theme.

Participants will work at the Shaker Lakes Regional Nature Center, 2600 South Park Boulevard, Shaker Heights, Ohio, with a staff of professionals drawn from Cleveland State University and the Nature Center.

The Workshop Structure:

Phase I ORIENTATION
(June 28, 29, 30 and July 5, 6, 7)
Through a series of participatory learning activities designed to increase the individual's enjoyment, awareness, sensitivity, and closeness to the natural world, participants will increase their understanding and appreciation of our planet and its life systems. Building on this new relationship, participants will explore environmental themes as a means of integrating the curriculum and observe various approaches to teaching in the natural world.

Phase II PRACTICUM
(July 10-13, 17-20, 24-27)
Participants will observe and assist with a variety of classes based on environmental themes; plan a lesson for a group of children; evaluate plan as a direct result of feedback from experiences with the children; prepare instructional materials for use in the workshop; outline a unit of instruction for use in the individual participant's classroom.

Phase III IMPLEMENTATION
Participants will develop a unit around an environmental theme for use in their classroom; obtain feedback from peers and staff on the proposal; implement the unit in the classroom during the fall quarter; evaluate results with peers and staff upon conclusion of the unit.

Dates will be determined by participants for two hour sessions in October and early December.

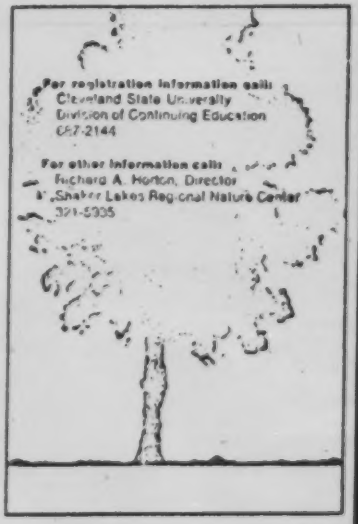
One additional hour of graduate credit is available for the implementation sessions from Cleveland State University.

Registration:

Fees: $160 — Tuition ($32 per credit hour)

$ 15 — Admission Fee (if not previously admitted as a CSU graduate student)

Space is limited to 15 participants.



CURRICULUM INTEGRATION THROUGH ENVIRONMENTAL STUDIES
EDW 511, Section 31, 5 Graduate Credits, June 28 - July 27, 1978

Please reserve a space for me for the workshop on Curriculum Integration Through Environmental Studies

I have been admitted to CSU Graduate Studies Yes ☐ No ☐

Early remittance of this form will assure you reservation for this workshop on a first come, first served basis. Persons not returning this form may be admitted at the first class meeting on a space-available basis. Such admission cannot be guaranteed

Name _____ Telephone _____ Social Security Number ___/___/___

Address _____ City _____ Zip Code _____

School or Agency _____ Telephone _____

Address _____ Zip Code _____

Position or Title _____

Mail to Cleveland State University, Division of Continuing Education, 2344 Euclid Avenue, Cleveland, Ohio 44115

For registration information contact the Division of Continuing Education, 687-2144. For other information contact the College of Education Graduate Office at 687-4625.

Send no money. Registration will be conducted and fees will be collected at the first class meeting. You may pay by personal check made out to Cleveland State University, or you may pay by BASA or Master Charge. For persons not previously admitted to Cleveland State University College of Graduate Studies, a $15.00 admission fee must be added to the tuition.

PARTICIPANT RESERVATION REQUEST FORM

environmental experiences workshop for elementary teachers

Cleveland State University
Division of Continuing Education
2344 Euclid Avenue
Cleveland, Ohio 44115

NON-PROFIT ORGANIZATION
U.S. POSTAGE
PAID
CLEVELAND, OHIO
Permit No. 848

3 GRADUATE CREDIT WORKSHOP

environmental experiences workshop for elementary teachers

CLEVELAND STATE UNIVERSITY
COLLEGE OF EDUCATION

SHAKER LAKES REGIONAL NATURE CENTER
ENVIRONMENTAL EXPERIENCES WORKSHOP FOR ELEMENTARY TEACHERS

DAILY SCHEDULE

June 28

A. Gathering and get acquainted; Create a nametag that shares a favorite part of the environment; introduce selves and share tag.
B. Acclimatization Walk - Changing your perspective on the environment
LUNCH
C. What is Environmental Education? - presentation of differing views with film or filmstrip; discussion
D. Magic Spot Time - What is it?
E. Dismissal

June 29

A. Setting Goals: Staff's goals, setting your own goals, work in pairs to be checkers on progress; share goals
B. Magic Spot Time
C. Evaluation & Contracts: creative evaluation ideas, use of grading contracts, distribution of contract forms
LUNCH
D. Classes at the Nature Center: observe and participate in afternoon classes
E. Reactions/ Observations/ Discussion

June 30

A. An Immersion Experience
B. The Sharing Experience: value for feedback and evaluation examples: sharing walk, circle, whispers, etc.
LUNCH
C. Brainstorming - A classic way to generate ideas; use natural object, water, which will become basis of theme for workshop
D. Magic Spot Time
E. Formation of teacher groups for working with classes
F. Check-up on goals

SLRNC Summer 1978 Workshop

July 5

A. Observation/Participation of Nature Center Classes
B. Discussion
C. Magic Spot Time
LUNCH
D. Theme development through learning centers
E. A Sharing Technique

July 6

A. Observation/ Participation of another set of Nature Center Classes
B. Discussion
C. Magic Spot Time
LUNCH
D. Teaching assignments: brainstorm on topic by each teaching team; share best 5 ideas
E. Another Immersion Experience

July 7

A. An ACC walk to explore another part of the environment
B. Contracts: Discussion and Completion
LUNCH
C. Planning a Teaching Unit: A Panel Discussion off top of head from topics and questions raised by participants
D. Do You Feel Oriented?

July 10

A. Nature Center Offerings - Term II: description of classes teachers will be observing and working with: "Things with Scales", "Creative Science", "Entomology", "Nature Nursery"
B. Activities in the Environment - I
LUNCH
C. Activities in the Environment - II
D. Magic Spot Time

SLRNC Summer 1978 Workshop

July 11

A. Observation/ Participation in Classes
B. General Discussion and Reaction
LUNCH
C. Activities in the Environment - III

July 12

Theme Day - Language Arts
A. ACC walk: Angles on the Marsh, poem: "Our Marsh Images on a Cup of Stream Water"
Vocabulary builder
Haiku at Lower Lake
Sharing
B. Word Maps
C. Magic Spot Time
LUNCH
D. Discussion of Language Arts
E. Micro-trail along the brook

July 13

A. Observation/ Participation in classes (rotate)
B. General Discussion and Reaction
LUNCH
C. Activities in the Environment - IV
D. Lesson planning

July 17

Theme Day - Social Studies
A. History Lesson Along Doan Brook
B. Discussion
C. Magic Spot Time
LUNCH
D. The Natural History of an Earth Species

SLRNC Summer 1978 Workshop

July 18

A. Observation/ Participation in classes
B. Reaction & Discussion
LUNCH
C. Lesson Planning and preparation for teaching

July 19

Theme Day - The Arts
A. ACC Walk: Color Chains along the brook
Crayons
Symphony
Negative Spaces
Seascapes
Gallery
B. Creating a Puppet Show: Divide into three groups to make puppets to play out an environmental mystery
write play
make puppets and backdrops from natural objects found around the water
LUNCH
C. Present puppet shows to group
D. Discussion: environmental arts

July 20

A. Observation/ Participation in classes
B. Reaction & Discussion
LUNCH
C. Complete lesson planning and prepare materials for class

July 24

Theme Day - The Built Environment
A. Tri-Wall for Creating Special Places
- tools, stools, tables, dividers, display
- a variety of teaching techniques, using the tools
- try your hand

SLRNC Summer 1978 Workshop

July 24 (cont.)
B. Magic Spot Time
LUNCH
C. Rotating Experiences: - Making Aquatic Bottle Gardens & Aquaria
- Hydroponics in the Classroom
- Foods, watery delights

July 25
A. Lesson Presentation I
B. Discussion & Reaction
LUNCH
C. Final Preparation, Contract Work, Open time for general discussion

---

July 26
Theme Day - Math & Science
A. Pond Water Study : sample collection
microscope study; identification, counting populations
graphing techniques
comparisons
color/ odor/ chemical properties
B. Magic Spot Time
LUNCH
C. Stream Study: Temperature, velocity (leaf race), Volume Flow
D. Evaporation Measurements in different mini-climates

July 27
A. Lesson Presentation - II
B. Reaction Discussion
C. Country Ramble - includes lunch, touches, readings
D. Sharing technique & Evaluation of workshop

summer workshop for elementary teachers

at Crosby Gardens Urban Environmental Center

IN COOPERATION WITH THE NATIONAL AUDUBON SOCIETY'S AULLWOOD AUDUBON FARM

July 26 to August 11 9:00 a.m.-2:00 p.m. • 4 to 6 Graduate Credits

TEACHER EXPERIENCES FOR CURRICULUM INTEGRATION OF ENVIRONMENTAL STUDIES

about the program...

Environmentalists in recent decades sensitized a large portion of our population to the need for individual and societal consciousness of man's role in the ecosystem. The education process in schools provides the means by which our society can be prepared to make appropriate environmental decisions. Young children make up one of the most receptive components with which to begin this educative process.

This 10-day Teacher Experience Workshop will provide 1) firsthand experiences in the sociological and physical environment that may be translated into instructional activities; 2) teaching strategies and resources necessary to implement instruction; 3) the opportunity to plan for environmental studies suitable for the classroom; 4) a means to implement the plans in the classroom.

Teachers will work at the Crosby Gardens Urban Environmental Center with a staff of professionals who are drawn from the following institutions.

University of Toledo
NAS Aullwood Farm
Crosby Gardens

workshop structure...

Phase I - ORIENTATION. Become familiar with what environmental education means; learn how it can integrate various subject areas into a meaningful whole; explore Crosby Gardens and the UT Arboretum as an example of the resources available to you; organize a program of instruction in environmental studies under professional guidance.

Phase II - PRACTICUM. Put your plan of instruction into practice with elementary children drawn from area schools; discuss and evaluate plans as a direct result of feedback from experiences with the children; prepare instruction materials for use in the workshop; discuss adapting instructional plans for use in your classroom.

Phase III - IMPLEMENTATION. Develop an environmental studies unit for use in your classroom; obtain feedback from peers on your proposal; implement unit in classroom during the fall quarter; evaluate with peers upon conclusion of unit.

October 7 - 10:00 a.m. - 12:00 noon
November 18 - 10:00 a.m. - 12:00 noon

registration...

Fees: Tuition - $28.75 per credit hour

$20 - Admission fee (if not previously admitted as UT graduate student)

Space is limited to 15 participants. A $20 deposit with the completed attached form will provide for your admission and/or reservation in the workshop. Balance is due by July

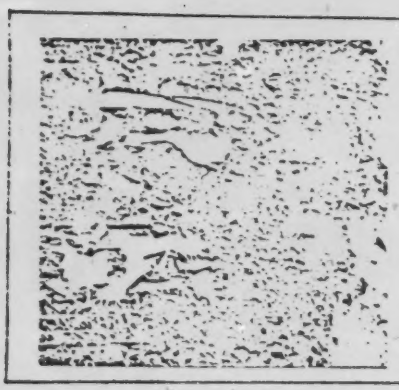
Make check payable to the University of Toledo.

For more information call:

Jerry Underfer
University of Toledo
537-2039

or

Cindy Millen
Crosby Gardens
536-8365



Summer Workshop for Elementary Teachers

Crosby Gardens

This program is made possible through a grant from the George Gund Foundation Cleveland, Ohio and in cooperation with the National Audubon Society's Aullwood Audubon Farm University of Toledo Crosby Gardens

TEACHER EXPERIENCE WORKSHOP
CURRICULUM INTEGRATION THROUGH ENVIRONMENTAL STUDIES

Please reserve a space for me for the Teacher Experience Workshop--Curriculum Integration Through Environmental Studies. Enclosed is a check for $20 made payable to The University of Toledo. Balance will be paid on July 24. I understand you will send me the necessary forms and other information as soon as you receive my reservation.

Name_____Telephone_____Social Security Number___/__/___

Address_____Zip Code_____

School_____Telephone_____

I have been admitted to the UT Graduate School. Yes☐No☐I was a Provisional☐Non-Degree☐

Regular Student☐ I wish to apply as a Non-Degree☐Regular Graduate☐Non-Credit Student☐
Return to: J. L. Underfer, Director of the EDYE Program,
University of Toledo, Toledo, OH 43606

APPENDIX B

New Jersey State Plan for Self Evaluation of Environmental Education

B-5 STANDARD: In-Service Preparation

A program of in-service preparation for classroom teachers providing for acquisition of new understandings, perceptions, skills and techniques required in the project should be developed and established.

Has an in-service program been developed?

___Yes ___No

If yes, check those areas that are applicable:

Skills ___
Methods (list)
_____
_____
_____
Research ___
Concepts ___
Content (list)
_____
_____
_____
Teaching aids or materials ___
Personal growth and understanding ___
Other
_____
_____

If no, go on to Standard B-6

a.(1) Is in-service training an established and continuing facet of the project?

___Yes ___No

Type of Program: (Check all that apply)

College credit ___
Salary credit ___
Voluntary ___
Required ___
Free time ___
School time ___
Stipend ___
No stipend ___
Summer ___
Special course by outside agency ___
Other (specify) ___

a.(2) Expenses borne by:

Project ___
LEA(s) ___
Teachers ___
Other (specify) ___

b. Was a validated instrument developed to measure teacher behavioral change?

a.(1) How is the in-service training implemented? (Check all that apply)

Class of students with teachers ___
Lecture ___
Demonstration ___
Skill practice using children ___
Method practice using children ___
Teacher alone ___
Seminars ___
Other (specify)

a.(2) The in-service training is led by? (Check all that apply)

Project staff ___
Consultant ___
School personnel ___
Other (specify) ___

a.(1) Is the in-service trainin program effective in term of the total project?

___Yes ___N

a.(2) Were teacher skills and learnings developed in t in-service program uti- lized in project activi- ties?

___Yes ___N

a.(3) If yes, how? (Check all that apply)

Leadership in activities _
Communication with staff _
Improved technique _
Improved teacher effectiveness _
with students _
with other teachers _
Assists project staff _
Develops own materials _
Other (specify) _

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APPENDIX C

Instruments:

Forms A, B, C, D

Checklists:

Forms E, F, G

FORM A 1

1. Name _____

2. School _____

   School
   Address _____
   _____

3. Principal _____

4. School phone _____

5. Home phone (optional) _____

6. Grade and subject(s) currently teaching _____

   _____

7. Other teachers of the same grade in your school

Name	Subject(s)
_____	_____
_____	_____
_____	_____
_____	_____

8. If you are involved in team teaching, please indicate the number of other teachers on your team. _____

9. Undergraduate degree and major _____

10. Graduate degrees and majors (Please indicate also if you are working toward a graduate degree and your major.) _____

11. Number of years of teaching experience _____

12. Have you ever attended an environmental education workshop or course? _____

    If yes, please list the location, length and date of the experience(s). _____
    _____
    _____

FORM A

13. What is your definition of environmental education?

14. In what subject area(s) do you feel environmental education whould take place?

PLEASE PLACE A CHECK IN THE BLANK WHICH BEST INDICATES YOUR RESPONSE TO THE QUESTION FOR EACH PAIR OF WORDS.
For example: How do you feel about the development of solar energy? agree ✓_ _ _ _ disagree

This check indicates strong agreement with the development of solar energy.

15. How does the administration in your district feel about including environmental education in the curriculum?

encourage	_ _ _ _ _	discourage
negative	_ _ _ _ _	positive
important	_ _ _ _ _	unimportant

16. How do you feel about teaching environmental education in your classroom?

unnecessary	_ _ _ _ _	necessary
helpful	_ _ _ _ _	harmful
confident	_ _ _ _ _	unsure

17. How do you feel about students working with materials and equipment other than paper and pencil in the classroom?

beneficial	_ _ _ _ _	harmful
difficult	_ _ _ _ _	easy
not important	_ _ _ _ _	important

18. How do you feel about taking your students out-of-doors for lessons?

beneficial	_ _ _ _ _	harmful
important	_ _ _ _ _	not important
easy	_ _ _ _ _	difficult

19. Check two of the following that you would prefer to have emphasized at an environmental education workshop.

___ concepts
___ skills (use of microscope, etc.)
___ resource materials
___ your personal understanding of environmental subjects
___ teaching methods

20. What type of assistance would be most valuable to you in utilizing environmental education at your school? (check two)

___ planning the lessons
___ school site study or development
___ specialists and consultants
___ materials and equipment

PLEASE ANSWER THE FOLLOWING QUESTIONS IN RELATION TO THE PAST SCHOOL YEAR (1977-1978).

21. Did you teach an ecology or environmental education lesson or unit? _____

If yes, please indicate how much time was involved.

22. Did you take your class out-of-doors for lessons? _____

If yes, please indicate the number of times you did so. _____

23. Did you take your class on an environmental education oriented field trip? _____

FORM A

24. Did your class have a resident camping experience?

_____

If yes, please indicate the length of the experience and what your responsibilities were.

25. How often did you use "hands-on" activities (materials and equipment other than paper and pencil) in your classroom?

___ more than once per week
___ once per week to once per month
___ once or twice per semester
___ once or twice per year
___ not at all

FROM THE FOLLOWING LIST OF CONCEPTS, PLEASE INDICATE WITH A CHECK ANY THAT APPROXIMATE THE CONCEPTS YOUR STUDENTS WERE TO LEARN FROM SPECIFIC LESSONS OR UNITS YOU TAUGHT THIS PAST YEAR.

I

___ 1. Living things are interrelated with one another and their environment.

___ 2. Green plants are the ultimate sources of food, clothing, shelter, and energy in most societies.

___ 3. An organism is the product of its heredity and environment.

II

___ 4. The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

___ 5. The relationships between man and the natural environment are mediated by his culture.

FORM A

III

___ 6. The management of natural resources to meet the needs of successive generations demands long-range planning.

___ 7. Family planning and the limiting of family also are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.

IV

___ 8. Organisms and environments are in constant change.

___ 9. The rate of change in environment may exceed the rate of organism adaptation.

PLEASE GIVE A SHORT DESCRIPTION OR EXAMPLE THAT YOU FEEL ILLUSTRATES EACH OF THE ABOVE CONCEPTS.

1.

2.

3.

4.

5.

6.

7.

8.

9.

FORM B

1. Name _____

2. School _____
   Address _____

3. Grade and subject(s) currently teaching
   _____
   _____

4. What is your definition of environmental education?

5. With what subject(s) do you feel environmental education should take place?

PLEASE PLACE A CHECK IN THE BLANK WHICH BEST INDICATES YOUR RESPONSE TO THE QUESTION FOR EACH PAIR OF WORDS.

For example: How do you feel about the development of solar energy? agree ✓ _ _ _ _ disagree

(This check indicates strong agreement with the development of solar energy.)

6. How does the administration in your district feel about including environmental education in the curriculum?

encourage	_ _ _ _ _	discourage
negative	_ _ _ _ _	positive
important	_ _ _ _ _	unimportant

7. How do you feel about teaching environmental education in your classroom?

unnecessary	_ _ _ _ _	necessary
helpful	_ _ _ _ _	harmful
confident	_ _ _ _ _	unsure

8. How do you feel about students working with materials and equipment other than paper and pencil in the classroom?

beneficial	_ _ _ _ _	harmful
difficult	_ _ _ _ _	easy
not important	_ _ _ _ _	important

FORM B

9. How do you feel about taking your students out-of-doors for lessons?

beneficial	_ _ _ _ _	harmful
important	_ _ _ _ _	not important
easy	_ _ _ _ _	difficult

10. Check two of the following that you would prefer to have emphasized at an environmental education workshop.

___ concepts
___ skills (use of microscope, etc.)
___ resource materials
___ your personal understanding of environmental subjects
___ teaching methods

11. What type of assistance would be most valuable to you in utilizing environmental education at your school? (check two)

___ planning the lessons
___ school site study or development
___ specialists and consultants
___ materials and equipment

PLEASE ANSWER THE FOLLOWING QUESTIONS IN RELATION TO THIS SCHOOL YEAR (1978-1979) (SINCE SEPTEMBER).

12. Did you teach an ecology or environmental education lesson or unit? _____
If yes, please indicate how much time was involved._____

13. Did you take your class out-of-doors for lessons? _____
If yes, please indicate the number of times you did so.___

14. Did you take your class on an environmental education oriented field trip? _____

15. Did your class have a resident camping experience? _____
If yes, please indicate the length of the experience and what your responsibilities were.

16. How often did you use "hands-on" activities (materials and equipment other than paper and pencil) in your classroom?
___ more than once per week
___ once per week to once per month
___ once or twice per semester
___ once or twice per year
___ not at all

FORM B

FROM THE FOLLOWING LIST OF CONCEPTS, PLEASE INDICATE WITH A CHECK ANY THAT APPROXIMATE THE CONCEPTS YOUR STUDENTS WERE TO LEARN FROM SPECIFIC LESSONS OR UNITS YOU HAVE TAUGHT THIS YEAR.

I

___ 1. Living things are interrelated with one another and their environment.

___ 2. Green plants are the ultimate sources of food, clothing, shelter, and energy in most societies.

___ 3. An organism is the product of its heredity and environment.

II

___ 4. The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

___ 5. The relationships between man and the natural environment are mediated by his culture.

III

___ 6. The management of natural resources to meet the needs of successive generations demands long-range planning.

___ 7. Family planning and the limiting of family also are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.

IV

___ 8. Organisms and environments are in constant change.

___ 9. The rate of change in environment may exceed the rate of organism adaptation.

FORM C

1. Name_____

2. School _____
   Address _____

3. What is your definition of environmental education?

4. In what subject area(s) do you feel environmental education should take place?

5. Check two of the following that you would prefer to have emphasized at an environmental education teacher workshop.

   ___ concepts
   ___ skills (use of microscope, etc.)
   ___ resource materials
   ___ participants' personal understanding of environmental subjects
   ___ teaching methods

6. What type of assistance would be most valuable to you in utilizing environmental education at your school? (check two)

   ___ planning the lessons
   ___ school site study or development
   ___ specialists and consultants
   ___ materials and equipment

   PLEASE PLACE A CHECK IN THE BLANK WHICH BEST INDICATES YOUR RESPONSE TO THE QUESTION FOR EACH PAIR OF WORDS.

   For example: How do you feel about the development of solar energy? agree ✓ _ _ _ _ disagree

   (This check indicates strong agreement with the development of solar energy.)

7. How do you feel about including environmental education in the curriculum?

   encourage _ _ _ _ _ discourage
   negative _ _ _ _ _ positive
   important _ _ _ _ _ unimportant

FORM C

8. How do you feel about students working with materials and equipment other than paper and pencil in the classroom?

beneficial	_ _ _ _ _	harmful
difficult	_ _ _ _ _	easy
not important	_ _ _ _ _	important

9. How do you feel about teachers taking their students out-of-doors for lessons?

beneficial	_ _ _ _ _	harmful
important	_ _ _ _ _	not important
easy	_ _ _ _ _	difficult

PLEASE ANSWER THE FOLLOWING QUESTIONS IN RELATION TO THIS SCHOOL YEAR (1978-1979) (SINCE SEPTEMBER).

10. Has _____ taught an ecology or environmental education lesson or unit this year? _____
If yes, please indicate how much time was involved._____

11. Has this teacher taken his/her class out-of-doors for lessons? _____
If yes, please indicate the number of times. _____

12. Has this teacher lead an environmental education oriented field trip? _____

13. Has this teacher made use of "hands-on" activities (materials and equipment other than paper and pencil)
___ more than once per week
___ once per week to once per month
___ once or twice per semester
___ once or twice per year
___ not at all

FORM D

PLEASE INDICATE WITH A CHECK THE DEGREE TO WHICH YOU FEEL EACH OF THE FOLLOWING ACTIVITIES WAS EMPHASIZED IN THE ENVIRONMENTAL EDUCATION WORKSHOP YOU ATTENDED LAST SUMMER.

STRONG EMPHASIS	NO EMPHASIS	
_ _ _ _ _		1. Define environmental education and its philosophy.
_ _ _ _ _		2. Learn to integrate environmental education with existing subjects.
_ _ _ _ _		3. Explore the resources of the workshop site.
_ _ _ _ _		4. Prepare an initial program of instruction.
_ _ _ _ _		5. Evaluate and discuss these initial programs or lessons.
_ _ _ _ _		6. Discuss means for adapting instructional plans for use in the classroom.
_ _ _ _ _		7. Use of outside resource people.

8. In general, how do you feel about the materials you developed during the workshop?

strong	_ _ _ _ _	weak
useful	_ _ _ _ _	not useable
pleased	_ _ _ _ _	dissatisfied

9. How did you feel about having children participate in the workshop?

beneficial	_ _ _ _ _	harmful
unnecessary	_ _ _ _ _	necessary
encouraging	_ _ _ _ _	discouraging

FORM E _ OBSERVER'S CHECKLIST FOR USE AT THE WORKSHOP
TEACHER ACTIVITIES

Date:
Location:
Activity:
Teacher:

1. Are there written plans for the activity?

2. Are there goals or objectives for the activity?
   If yes, are the objectives
   c-cognitive
   a-affective
   b-behavioral-psycho-motor

3. Plans include:
   list of materials needed
   activity directions
   discussion questions
   means of evaluating

4. Give the number of each concept on the list that the lesson dealt with.

5. Activities or materials were-
   prepared by teacher
   prepared by workshop leaders
   commercial materials

6. Activity involves "hands-on" experience for the children

7. Activity involves "discovery learning"

8. Activity involves "process approach"

9. Was lesson plan used with the children
   just as prepared
   slightly modified
   moderately modified
   changed completely from original (why?)

10. Was the teacher pleased with the lesson?
    very please _ _ _ _ _very dissatisfied

FORM F- OBSERVER'S CHECKLIST FOR USE AT THE WORKSHOP
DISCUSSION OF LESSON PLANS OR MATERIALS

Date:
Location:
Activity:
Participants:

1. Are there discussions of the lessons used with the workshop children?

2. Are resource people, other than the sponsors, involved in the discussions?

3. Does the leader make suggestions or offer assistance with problems?

4. Do peer teachers make suggestions or offer assistance with problems?

5. Does the leader discuss or suggest methods and and activities for adapting plans to the classroom (or encourage the participants to make such suggestions?)

6. Does the discussion refer to the definition or philosophy of EE?

7. Is there discussion of interdisciplinary teaching?

8. Is there reference to specific concepts that can or should be taught (give the number of each concept that is referred to)?

9. Are there suggestions for use of "hands-on" (h) materials or experiences? Discovery learning (dl)? Process approach (pa)?

10. Is the discussion-
anecdotal, participant led _ _ _ _ _leader strongly controlled

FORM G
GROUP ACTIVITY

DATE:
TIME:
ACTIVITY:
LOCATION:
LEADER(S):

_____

1. Leader refers to environmental education definition or philosophy.

_____

2. Participants are encouraged to formulate, think about or discuss their own EE definition or philosophy.

_____

3. The leader suggests ways to integrate EE with subject areas--(name subjects).

_____

4. Participants are encouraged to think about or discuss ways of practicing interdisciplinary teaching.

_____

5. Concepts referred to by the leader as part of the participants' education (give number of concept if on list)

_____

6. Activities to be used with students
   m-mentioned
   e-explained
   d-demonstrated

   h-hands-on
   dl-discovery
   pa-process approach

   concepts involved

   subjects incorporated

APPENDIX D

Days Researcher Was in Attendance at Each In-Service Program

Days the researcher was in attendance at each in-service program.

June	July	August
19 - Columbus	5 - Columbus	1 - Toledo
20 - Dayton	6 - Columbus	2 - Toledo
21 - Dayton	10 - Cleveland	7 - Toledo
22 - Columbus	11 - Cleveland	
23 - Dayton	13 - Columbus	
27 - Dayton	17 - Cleveland	
28 - Cleveland	18 - Columbus	
29 - Cleveland	19 - Columbus	
30 - Dayton	24 - Cleveland	
	25 - Cleveland	
	26 - Toledo	
	27 - Toledo	
	31 - Toledo	

Totals

Dayton - 5 days
Columbus - 7 days
Cleveland - 7 days
Toledo - 6 days

APPENDIX E

Computer Coding Sheets

Forms A, B, C and D

COMPUTER CODING SHEETS - FORMS A & B

COLUMN POST	PRE	VARIABLE & CATEGORIES
	1	GROUP
		1 C-1 first comparison (Fundamentals of Supervision)
		2 C-2 second comparison (teachers in home schools of participants)
		3 E experimental
		4 P principals
	2	LOCATION
		1 Dayton
		2 Columbus
		3 Cleveland
		4 Toledo
	3&4	INDIVIDUAL IDENTIFICATION NUMBER
	5&6	SCHOOL
46	7	GRADE TAUGHT
		1 K,1,2
		2 3,4,5
		3 6,7,8
		4 9,10,11,12
47	8	SUBJECT TAUGHT
		1 self contained class
		2 science or mathematics
		3 social studies or lang. arts.
		4. fine or applied arts (home ec., indus. arts)
		5 special education or phys. ed.
	9	NUMBER OF OTHER TEACHERS ON TEAM
		1 none
		2 1 or 2
		3 more than 2

COMPUTER CODING SHEETS - FORMS A & B

10 UNDERGRADUATE MAJOR
- 1 elementary education
- 2 science or math
- 3 social studies or lang. arts
- 4 fine or applied arts
- 5 special ed. or phys. ed.
- 6 combination

11 GRADUATE DEGREE
- 1 none
- 2 master's or working toward
- 3 Ph.D. or working toward

12 GRADUATE MAJOR
- 1 environmental education, science and math ed.
- 2 early and middle childhood M.A.T. or secondary ed.
- 3 curriculum, administration
- 4 English, reading, history, fine arts, applied arts
- 5 special ed., phys. ed.
- 6 combination

13 NUMBER OF YEARS OF TEACHING EXPERIENCE
- 1 1-4
- 2 5-9
- 3 10-14
- 4 15-19
- 5 20+

14 ENVIRONMENTAL EDUCATION WORKSHOPS
- 1 none
- 2 1-3 days
- 3 1 course or extended workshop
- 4 more than 1 course or several workshops

48 15 SUBJECT AREAS FOR ENVIRONMENTAL EDUCATION
- 1 all subjects
- 2 science, math, social studies
- 3 lang. arts, fine arts, applied arts
- 4 phys. ed. or health
- 5 3 or more subjects listed singly
- 6 separate discipline

COMPUTER CODING SHEETS - FORMS A & B

		ADMINISTRATIONS' ATTITUDE TOWARD E^2	
49	16	encourage 5 4 3 2 1	discourage
50	17	negative 1 2 3 4 5	positive
51	18	important 5 4 3 2 1	unimportant
		TEACHER'S ATTITUDE TOWARD E^2	
52	19	unnecessary 1 2 3 4 5	necessary
53	20	helpful 5 4 3 2 1	harmful
54	21	confident 5 4 3 2 1	unsure
		MATERIALS OTHER THAN PAPER & PENCIL	
55	22	beneficial 5 4 3 2 1	harmful
56	23	difficult 1 2 3 4 5	easy
57	24	not important 1 2 3 4 5	important
		TAKING STUDENTS OUT-OF-DOORS	
58	25	beneficial 5 4 3 2 1	harmful
59	26	important 5 4 3 2 1	not important
60	27	easy 5 4 3 2 1	difficult

61&62 28&29 PREFER TO HAVE EMPHASIZED AT E^2 WORKSHOP

1 concepts
2 skills
3 resource materials
4 personal understandings
5 teaching methods

63&64 30&31 ASSISTANCE MOST VALUABLE IN USING E^2 AT SCHOOL

1 planning the lesson
2 school site study or development
3 specialists and consultants
4 materials and equipment

65 32 TEACH AN ECOLOGY OR E^2 LESSON OR UNIT

1 none
2 less than 1 week
3 1-3 weeks
4 4-8 weeks
5 more than 8 weeks

66	33	NUMBER OF TIMES CLASS OUT-OF-DOORS	
		1	none
		2	1-5
		3	6-10
		4	11-15
		5	more than 15
67	34	ENV. ED. ORIENTED FIELD TRIP	
		1	no
		2	yes
68	35	RESIDENT CAMPING EXPERIENCE	
		1	none
		2	1-3 days
		3	4-7 days
		4	more than 7 days
69	36	HOW OFTEN USE "HANDS-ON" ACTIVITIES	
		5	more than once per week
		4	once per week to once per month
		3	once or twice per semester
		2	once or twice per year
		1	not at all
70-78	37-45	CONCEPTS 1-9 USED	
		0	no
		1	yes

COMPUTER CODING SHEETS - FORM C

COLUMNS	VARIABLE & CATEGORIES
1-4	IDENTIFICATION NUMBER
5&6	SCHOOL
48	SUBJECTS FOR ENV. ED. 1 all subjects 2 science, math, social studies 3 lang. arts, fine arts, applied arts 4 phys. ed. or health 5 3 or more listed singly 6 separate discipline
61&62	EMPHASIZED AT ENV. ED. TEACHER WORKSHOP 1 concepts 2 skills 3 resource materials 4 personal understandings 5 teaching methods
63&64	ASSISTANCE MOST VALUABLE IN USING E^2 AT SCH. 1 planning the lessons 2 school site study or development 3 specialists and consultants 4 materials and equipment
	HOW FEEL ABOUT ENV. ED. IN CURRICULUM
49	encourage 5 4 3 2 1 discourage
50	negative 1 2 3 4 5 positive
51	important 5 4 3 2 1 unimportant
	STUDENTS WORKING WITH MATERIALS AND EQUIPMENT OTHER THAN PAPER AND PENCIL
55	beneficial 5 4 3 2 1 harmful
56	difficult 1 2 3 4 5 easy
57	not important 1 2 3 4 5 important
	TEACHERS TAKING STUDENTS OUT-OF-DOORS
58	beneficial 5 4 3 2 1 harmful
59	important 5 4 3 2 1 not important
60	easy 5 4 3 2 1 difficult

COMPUTER CODING SHEETS - FORM C

70-73 TEACHER IDENTIFICATION NUMBER

65 TAUGHT LESSON OR UNIT IN ENV. ED.
1 none
2 less than 1 week
3 1-3 weeks
4 4-8 weeks
5 more than 8 weeks

66 TOOK CLASS OUT-OF-DOORS
1 none
2 1-5
3 6-10
4 11-15
5 more than 15

67 ENV. ED. ORIENTED FIELD TRIP
1 no
2 yes

69 HOW OFTEN USE "HANDS-ON" ACTIVITIES
5 more than once per week
4 once per week to once per month
3 once or twice per semester
2 once or twice per year
1 not at all

COMPUTER CODING SHEET - FORMS A & C
SCHOOLS

01	Westbrook Elementary
02	Fairborn-Baker High School
03	Southdale (Kettering)
04	Monticello (Wayne Township)
05	Olive Branch High School
06	East Elementary
07	Demmitt Elementary
08	Cedarcliff Elementary
09	Hook Elementary
10	Richard Avenue Elementary
11	Westerville North High School
12	Blendon Junior High
13	Parkmoor Elementary
14	Canal Winchester Elementary
15	Mifflin High School
16	Bellefaire School
17	Berea Alternative School
18	William D. Howell
19	Sussex School
20	Mayfair Elementary
21	Meadowvale Elementary
22	McGregor
23	Rossford (Glenwood)
24	Wood County Special Education School District
25	Eagle Point Elementary
26	St. John's High School
27	Hiawatha
28	Morenci Middle School
29	Stiles Elementary
30	St. Francis DeSales High School
31	Richey School
32	Prairie Lincoln Elementary
33	Adams Junior High
34	Granville High School
35	Fishinger School
36	Fairbanks Local Junior High
37	Upper Arlington High School
38	Pickerington Elementary
39	Monterey Elementary
40	Mifflin Junior High
41	Hayesville Elementary
42	Walnut Springs Middle School
43	Pleasant Hill Elementary
44	Ludlow

COMPUTER CODING SHEETS - FORM D

COLUMN		VARIABLE & CATEGORIES
1-4		IDENTIFICATION NUMBER
	strong emphasis / no emphasis	
5	5 4 3 2 1	Define E^2 and its philosophy
6	5 4 3 2 1	Learn to integrate env. ed. with existing subjects
7	5 4 3 2 1	Explore resources of site
8	5 4 3 2 1	Prepare program of instruction
9	5 4 3 2 1	Evaluate & discuss programs of instruction
10	5 4 3 2 1	Discuss means for adapting instr. plans for use in class
11	5 4 3 2 1	Use of outside resource people
		FEEL ABOUT MATERIALS DEVELOPED DURING WS
12	strong 5 4 3 2 1	weak
13	useful 5 4 3 2 1	not useable
14	pleased 5 4 3 2 1	dissatisfied
		FEEL ABOUT HAVING CHILDREN PARTICIPATE IN THE WORKSHOP
15	beneficial 5 4 3 2 1	harmful
16	unnecessary 1 2 3 4 5	necessary
17	encouraging 5 4 3 2 1	discouraging

APPENDIX F

Frequencies for Teacher Background Variables

Frequencies for teacher background variablesfor first comparison, second comparison, and experimental groups.

VARIABLE AND CATEGORIES	Comp.1	Comp.2	Exp.	Total
LOCATION				
1)Dayton	0	5	9	14
2)Columbus,	17	5	7	29
3)Cleveland	0	2	5	7
4)Toledo	0	1	9	10
GRADE TAUGHT				
1)K,1,2	0	1	8	9
2)3,4,5	9	3	13	25
3)6,7,8	3	5	4	12
4)9,10,11,12	5	4	5	14
SUBJECT TAUGHT				
1)self contained	9	4	18	31
2)science, math	1	6	7	14
3)soc. st., lang. arts	5	3	1	9
4)fine or applied arts	2	0	0	2
5)spec. ed., phys.ed.	0	0	4	4
NO. TEACHERS ON TEAM				
1)none	11	9	24	44
2)1 or 2	5	4	4	13
3)more than 2	1	0	2	3
UNDERGRADUATE MAJOR				
1)elem ed.	7	4	16	27
2)science, math	0	6	6	12
3)soc. st., lang. arts	5	2	3	10
4)fine or applied arts	1	0	0	1
5)spec. ed., phys. ed.	3	1	1	5
6)combination	1	0	4	5
GRADUATE DEGREE				
1)none	0	4	9	13
2)master's or working toward	15	9	20	44
3)Ph.D. or working toward	2	0	1	3

Frequencies for teacher background variables (cont.)

	Comp.1	Comp.2	Exp.	Total
GRADUATE MAJOR				
1) env. ed., sci.-math ed.	0	3	6	9
2) EMC, MAT, second.ed.	7	0	11	18
3) curricu., admin.	7	0	1	8
4) Eng., read., hi ., fine arts, applied arts	3	4	0	7
5) spec. ed., phys. ed.	0	0	2	2
6) combination	0	1	0	1
7) no response	0	5	10	15
YEARS TEACHING EXPERIENCE				
1) 1-4	10	2	9	21
2) 5-9	5	6	11	22
3) 10-14	0	3	3	6
4) 15-19	2	2	6	10
5) 20+	0	0	1	1
ENVIRONMENTAL EDUCATION WORKSHOPS OR COURSES				
1) none	8	8	19	35
2) 1-3 days	6	2	2	10
3) 1 course or extended workshop	0	0	5	5
4) more than 1 course or several workshops	3	3	4	10

APPENDIX G

Human Subjects Consent Form

Cover Letters for Mailed Questionnaires

Protocol No. _____

RESEARCH INVOLVING HUMAN SUBJECTS
CONSENT TO SERVE AS A SUBJECT IN RESEARCH

BEHAVIORAL AND SURVEY RESEARCH FORM

I consent to serve as a subject in the research investigation entitled : CHANGES IN CONCEPTS, ATTITUDES, AND SELECTED TEACHING SKILLS OF TEACHERS PARTICIPATING IN ENVIRONMENTAL EDUCATION WORKSHOPS.

The nature and general purpose of the research procedure have been explained to me. This research is to be performed by or under the direction of Dr. Robert E. Roth, who is authorized to use the services of others in the performance of the research.

I understand that any further inquiries I make concerning this procedure will be answered. I understand my identity will not be revealed in any publication, document, recording, video-tape, photograph, computer data storage, or in any other way which relates to this research. Finally, I understand that I am free to withdraw my consent and discontinue participation at any time following the notification of the Project Director.

Signed _____

Date _____

Time _____ A.M. P.M.

_____
Witness

_____
Investigator

4329 Chesford Rd., Apt. 1G
Columbus, Ohio 43224 (614)471-1803
September 13, 1978

I am a graduate student in environmental education at The Ohio State University. For my master's thesis, I am working with the Aullwood Audubon Farm and teachers in the Columbus, Dayton, Cleveland, and Toledo areas. As part of this study I am asking teachers to fill out a questionnaire in September and another in late November. I would also like to contact your principal and ask him or her some of the same questions you will find on the enclosed questionnaire.

Having been a teacher for several years, I know how busy you are at the beginning of a new school year with planning and paper work. However, I would greatly appreciate it if you could take about ten minutes to sign the consent form and respond to my questionnaire.

Your cooperation will be of great help to me and to the Aullwood Audubon Farm staff in their efforts to assist teachers throughout Ohio with environmental education.

If you have any questions, please feel free to use the stamped envelope not only to return the form but to request further explanation of the project.

Thank you,

Teresa Myer

4329 Chesford Rd., Apt. 1G
Columbus, Ohio 43224
September 26, 1978

Dear

Since I have not yet heard from you, I thought you might have misplaced the questionnaire I sent two weeks ago. I realize that you are very busy and have many other responsibilities and obligations. However, it would be a great help to the Aullwood Audubon Farm and my Master's thesis if you could spare a few minutes to fill out this form and mail it back.

Thank you for your cooperation, and again feel free to ask any questions you like concerning the project.

Sincerely,

Teresa Myer

4329 Chesford Rd., Apt. 1G
Columbus, Ohio 43224
November 30, 1978

It's hard to believe that it is December already. However, the time has arrived for the post-questionnaire section of my master's thesis study in conjunction with the Aullwood Audubon Farm.

Thank you again for completing the initial form a couple of months ago. In order for that effort to be of value in my research, I must have your response to the enclosed questions as soon as possible. Please feel free to ask anything you like about the study at the time you return the questionnaire in the envelope provided.

Your cooperation has been greatly appreciated. Have a very pleasant holiday season.

Sincerely,

Teresa Myer

4329 Chesford Rd., Apt. 1G
Columbus, Ohio 43224
December 30, 1978

Since everything is really busy before the holidays, it is understandable that you may not have had time to fill out the questionnaire I sent you a few weeks ago. Starting school again in January is also a demanding time, but I would really appreciate it if you could take a few minutes to answer my questions. I have enclosed another form for your convenience.

Thank you very much for your assistance. I hope you had a pleasant vacation.

Sincerely,

Teresa Myer

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